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THE IRRIGATION AGE

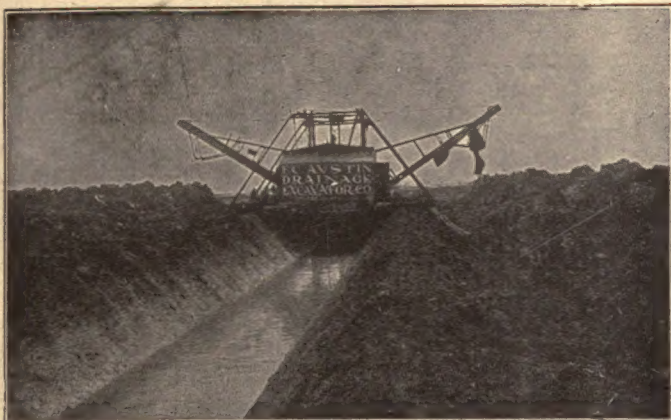
VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO 1

CHICAGO, NOVEMBER, 1909

You Don't Backfill a Drainage or Irrigation Ditch



If you did a dredge would be one of the finest machines in existence for digging them. A dredge-dug ditch backfills by caving and washing; this caving and washing would close the ditch except for the fact that it is always dug twice as large as necessary to allow for backfilling.

An Austin Drainage Excavator Ditch does not backfill, because it is carved with sloping sides in one operation from the solid soil. So perfect is its shape that, when an Austin Drainage Excavator is used on irrigation work, the lining follows the machine without an atom of trimming or tamping.

**WE SELL OUTRIGHT
OR LEASE**

The Austin Drainage Excavator
The Austin Levee Builder
The Austin Drag Line Excavator

OUR FULL LINE COMPRISES:

The Austin Side Hill Ditcher
The Austin Highway Ditcher
The Austin Orange Peel Ditcher

The Austin Rolling Platform Traction
The Austin Tile Ditcher
The Austin Stump Puller and Grubber

Send for Catalogue "S"

N. B.—AGENTS WANTED IN UNOCCUPIED TERRITORY

F. C. AUSTIN DRAINAGE EXCAVATOR CO.,

Railway Exchange,
Chicago Ill.

Morris Machine Works

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Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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Agents
21 Fremont St., S. Francisco, Cal.



THE IRRIGATION AGE COMPANY, Publishers, Chicago, Ill.

This issue celebrates the twenty-fifth
anniversary of the establishment of
THE IRRIGATION AGE

VIA RAIL OR BY AIR

ON



Union Pacific

"The Safe Road to Travel"

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Pacific Northwest

**14 Electric Lighted Trains
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is Double Track**

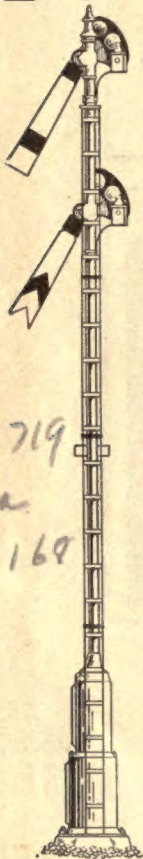
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**Electric Block Signals
Dining Car Meals and Service
"Best in the World"**

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**E. L. LOMAX, G. P. A.,
Omaha, Neb.**

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The Temple Irrigation Equipments the most Economical and Certain Means of Lifting Water

55 YEARS' EXPERIENCE

Write us for Information and Prices—State Requirements



CENTRIFUGAL PUMP AND GASOLINE ENGINE IRRIGATION OUTFIT.

The Temple Water Elevators --The Temple Centrifugal Pumps

Manufacturers of all kinds of Hand and Windmill Pumps

Also Manufacturers Single Cylinder, Double Cylinder and Four Cylinder Gasoline or Kerosene Engines

Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

THE TEMPLE PUMP CO.

Factory, 15th St. and 15th Place, near Canal St.
Chicago, Ill., U. S. A.

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SOME QUESTIONS ANSWERED

ABOUT THAT

6-PURPOSE IRRIGATION MACHINE

LET this page be a source of practical and immediate help to you. Send your questions to the Baker Mfg. Co., 726 Fisher Building, Chicago, who will have charge of this page regularly. They will answer each month questions on *Sage Brush Grubbing; Lateral Cutting; Shallow Drainage; Land Leveling; Border Making and Road Building.*

No. 1—Brush Grubbing Cost.

What is the least expensive method of ridding land of brush?

Ans.—The slow method is to dig out each plant one by one with a mattock. My! but it's patience-trying. Costs \$3 to \$4 an acre. Dragging a bent steel rail forwards and backwards over the brush with a team on each end is a little more satisfactory. But the rail leaves many a brush still standing that has to be dug out with a mattock. Costs about \$3.00 an acre.

Here's the quickest, cheapest method. Fasten the Sage Brush Cutter attachment to the 20TH CENTURY GRADER (see cuts Nos. 2 and 3), hitch on two teams. One man can easily drive. He alone can grub from four to five acres a day. If four horses and a man cost from \$5 to \$7.00 a day, it would figure \$1.00 to \$1.50 per acre.

No. 2—Grubbing and Plowing in One Operation.

Is it true that one can combine grubbing and plowing with a 20TH CENTURY MACHINE?

Ans.—Yes. This makes the irrigation farmer "sit up and take notice." This double use grubbing attachment slides along under the surface at a depth of four to six inches. It slashes off the brush root where the rootlets meet on the thickened root-stock. The prow shaped edge and the spreading knives (as they move through the soil) give it a thorough breaking up. The ground is in a No. 1 condition for immediate drilling in of alfalfa or cereals. Here's where the 20TH CENTURY saves great chunks of time and quite a roll of bills in the early spring where a man has just gotten onto his land and is eager to get a crop the first season.

20th Century Grader



No. 1—20th CENTURY CUTTING "V" SHAPED LATERAL

The loose dirt on the sides can be cut off, moved over, and leveled with the same machine. Thus no ground need be wasted. See answer to Question 4.

When writing to advertisers please mention The Irrigation Age.

No. 3—A Road Question.

Instead of burning sage brush have you heard of anyone spreading it on sandy roads?

Ans.—Yes. In Washington they do this. After travel once breaks it down, it improves the surface greatly. In Wisconsin they spread on sawdust for the same purpose. It's a good idea.

No. 4—Busy Season Ditching Cost.

Please give the quickest method of cutting laterals, especially in the spring when a man wants water quick and water company will soon turn on supply. What shape of ditch is most economical?

Ans.—The most expeditious is to get a 20TH CENTURY GRADER the fall before. Grub out brush and level down all your hummocks, carrying the extra dirt into the hollows. Then grade your land, sloping it gently from main sources of water, using the grader for both sloping and leveling. (See cut No. 4.)

The "V" shape ditch is best, because the sharp point at bottom compels water to flow more evenly and rapidly than when bottom is curved. The 20TH CENTURY cuts such a ditch. (See cut No. 1.) This lateral will measure 15 to 24 in. deep and 24 to 30 in. wide. An 18-inch ditch will carry 75 to 200 miner's inches of water per second according to the grade. A 24-inch ditch will accommodate 90 to 250 miner's inches per second according to the grade.

The cost for cutting such laterals is about \$1.25 to \$1.50 a mile. Two teams and a man cost from \$5.00 to \$7.00. They can cut from 5 to 6 miles a day.

With a plow and crowder the same outfit can finish but 2 miles, making the expense \$3.00 to \$4.00 per mile. A little figuring will indicate where the economy lies.

With a 20TH CENTURY this means double-quick work in the spring, when every minute counts. If a buyer has just moved onto his land he wants to get some sort of crop in so that the first water that's turned on will give him some benefit. Often a season's success or failure depends on the first soaking.

No. 5—Cleaning Trash From Laterals.

Can laterals be cleaned with this machine?

Ans.—Here's an answer from Byers, Colo. A. J. Nordloh, writes (after telling how he levels his land):

"Have used Grader in both sandy and clay soil, and will work in one as well as the other if the ground is dry enough, but if you can't plow it,

you can't grade it. This spring my laterals were full of thistles and trash so we could not run the plow, as they would get under the beam and pull the plow out. As I was passing one of these ditches with the Grader, thought we would try, but did not think we could do anything with it until we had taken the trash out. Well, once up and once back, and I had the prettiest ditch you ever saw. Took out the trash and everything, and left the ditch clean.

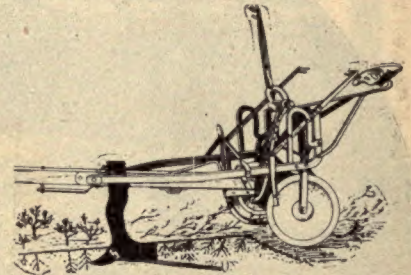
"We rented our Grader to a neighbor at \$1.00 a day. When he returned it, he paid us double the price, as he said he made more and better ditches in three days than he could make in a month with scrapers.

"I bought this Grader to make three miles of ditch, to carry water to a desert claim, and with four horses and myself we put water on the desert claim the first year. It beats all the big four-wheel graders to a frazzle."

No. 6—Where to Get Information.

Where can complete information regarding this machine be obtained?

Ans.—Write the manufacturers, The Baker Mfg. Co., No. 726 Fisher Building, Chicago. "Dollars in the Ditch," is the unique name of their new irrigation folder. They send it with a complete catalog. Both free.



No. 2—SAGE BRUSH CUTTER ATTACHED. Here the moldboard has been removed and cutter substituted. See answer to Question 1.



No. 3—SAGE BRUSH CUTTER.

This has a stiff, steel cutting edge sharpened and pointed to rip open the brush. At each side are two strong, keen knives that cut a swath 30 inches wide. See Question 2.



No. 4—MACHINE SET FOR LEVELING.

For cutting down "bumps" and hummocks, the blade is set at right angles, then lowered by main lever and a moderate slice cut off. The dirt is then spread and "spilled" as desired.

THIS COUPON GOOD FOR SOUVENIR

AT IRRIGATION EXPOSITION

Chicago, Nov. 20th to December 4th
At the Coliseum.

Write your name and address on the margin of this page, and mail if you can't come to the Exposition—we'll send you a souvenir. If you come, present it at our booth, which will be close to the Indian Blanket Weaver and Silversmith, opposite the main entrance, straight down center promenade.

THE BAKER MFG. CO.
726 Fisher Bldg., Chicago.

Myers Power Pumps

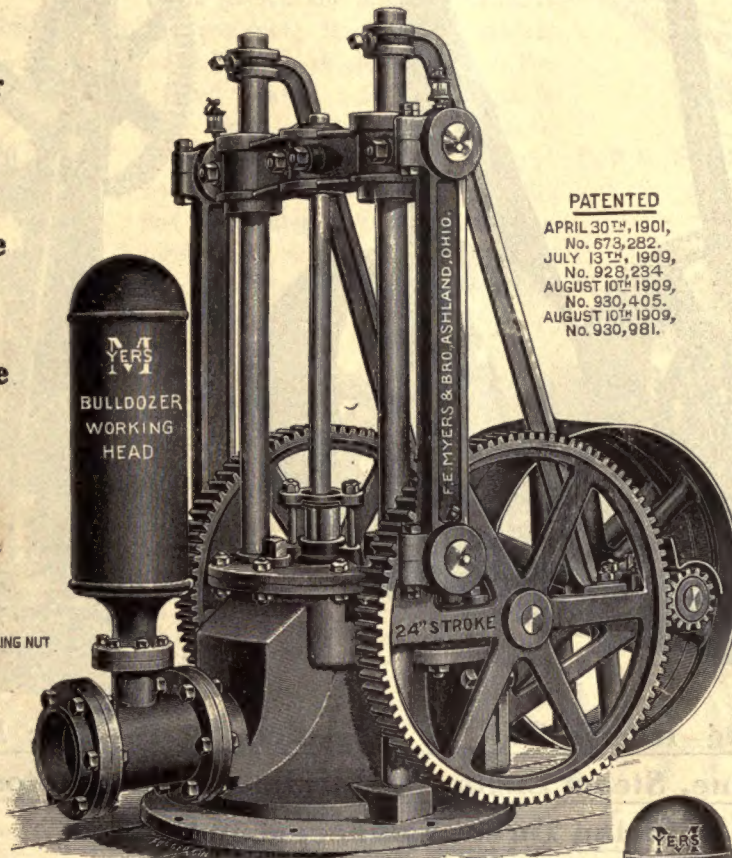
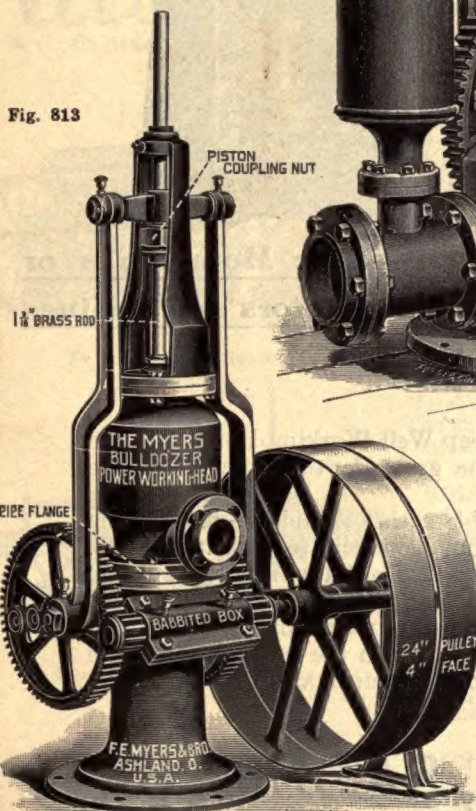
Working Heads, Pumping Jacks, Cylinders, Etc.

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The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches



PATENTED
APRIL 30TH, 1901,
No. 673,282.
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AUGUST 10TH, 1909,
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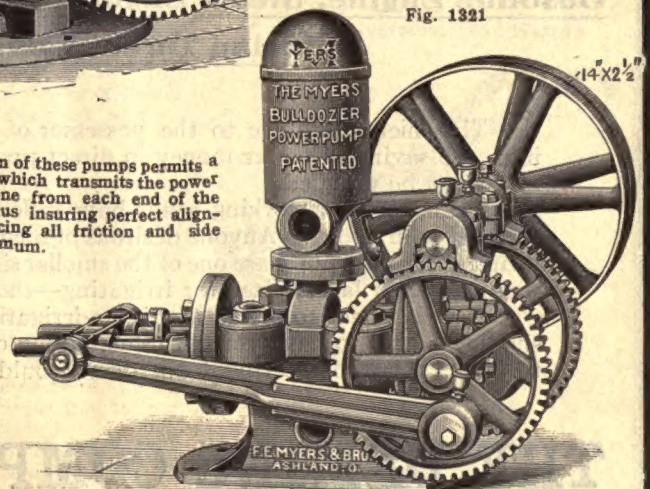
The Myers
Bulldozer
Power Pumps
For
Shallow Wells

Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

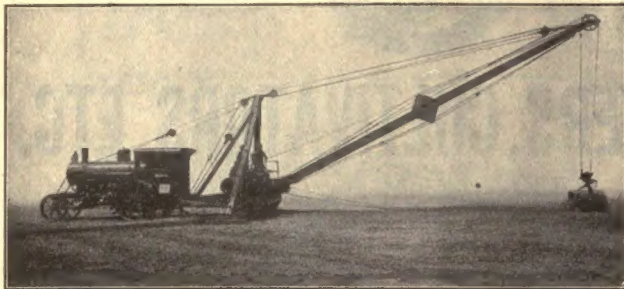
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Catalogue
and
Prices

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ASHLAND PUMP AND HAY TOOL WORKS

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Is the Greatest Traction Engine Built for Irrigation Work and the Irrigation Farmer.



Equipped with Steam Shovel Attachment.



Pulling Reversible Excavator on Irrigation Work.

It is an ALL AROUND ENGINE—Can be equipped with our Special Steam Shovel Attachment and used for digging irrigation ditches, building dams, filling wagons, and similar work. Will also pull excavators, graders, wagon trains, etc.; also unexcelled for threshing or for steam plowing.

It is UNDERMOUNTED—The only engine of its kind built. The only engine having a design adapted especially for heavy traction work. The undermounted construction gives it many points of important advantage over the top-mounted style as used by all others. Is more durable because no pulling strains on boiler. More powerful puller because straight line pull from cylinders to load. No engine so easy to handle for many reasons.

Avery Undermounted Engines are built in five sizes, 18, 20, 22, 30 and 40 Horse Power. Our Cockshutt-Avery Plow can also be furnished in five sizes, 5, 6, 8, 10 or 12 gang. We also build a large line of Platform, Bolster and Dump Wagons for traction engine hauling, and other attachments for our Undermounted Engines in the way of a special Steam Crane and Road Roller front trucks.

We are selling large numbers of these engines and attachments. Ask for complete catalog and prices.

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\$100 ON THIS TREE

IRRIGATED LAND IN THE GRAND VALLEY OF COLORADO

Pays greater profits than any other land on this earth. Hundreds of orchards return a net profit of \$500 per acre year after year. No other apple belt in the world can equal it. There are only two first class apple districts in the United States. The Grand Valley is the larger of the two. It grows more fruit and of better quality, and is 1500 miles nearer the market.

The Riverside Canal, now under construction, will irrigate practically all the unappropriated land in the Grand Valley. Riverside is the very choicest location in the Grand Valley for two reasons:

First:—It occupies a broad bench 300 feet above the river bottom, high above the region of spring frosts.

Second:—It lies at the foot of Grand Mesa, upon whose broad, flat top the snows of winter lie till spring, keeping Riverside cool and retarding the blossoms till danger of frost is past.

Remember, these two conditions. They are vital. They insure the superiority of Riverside for all time. Riverside and vicinity is the only spot in the temperate zone where all the elements of a perfect fruit region prevail.

This land will increase enormously in value in a very short time. It is the best land at the cheapest price and on the easiest terms.

On ten acres you pay but \$500 in ten years, and it will then be worth \$10,000, and in the meantime will pay good interest on the investment. Buy a 10 acre orchard tract and it will make you independent. NOW IS THE TIME TO BUY. Write me at once for map and full particulars.

J. B. FRISBEE

1636 Champa Street

Denver, Colorado

SIXTY BOXES OF APPLES PICKED FROM ONE TREE

World's Record Claimed by Orchard Owner
in the Grand Valley

GRAND JUNCTION, Colo., Oct. 24—(Special)—William Frey, part owner of the famous Grey-Wilson orchard near Clifton, has made affidavit to an apple yield from a single tree, which, it is believed, bids fair to take the world's record.

Sixty boxes of Ben Davis apples, worth over \$100, was picked Saturday from a single tree in Mr. Frey's orchard. In previous years as many as 40 boxes of apples were picked from this tree, which is about 12 years old, and it had a considerable local reputation, but this season's record surpasses all expectations. The entire orchard of 18 acres has yielded 7,000 boxes of apples worth net to the growers, about \$15,000. —*Denver Republican*.

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25% SAVED OF THE EXPENSE OF IRRIGATION

Send for our booklet, "COST OF IRRIGATION." It will save you money in irrigating.

We guarantee 25% more water with the same power, or the same amount of water with 25% less power than other make of pumping machinery. We have proved this greater efficiency by hundreds of tests and we are ready to prove it again.

Bulletin No. 104 illustrates and describes irrigation machinery

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AURORA, ILLINOIS, U. S. A.

Chicago Office, First National Bank Building.

Morse Bros. Machinery & Supply Co.,

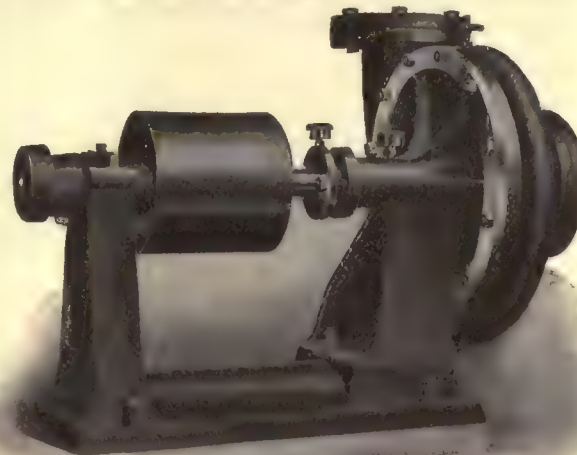
Denver, Colo.

Zimmerman-Wells Brown Company,

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San Francisco, Calif.



Farming BY Irrigation

Farming by Irrigation is in all ways more profitable than when it is dependent on rain

In Northern Colorado*—which is considered the best farming country on earth—farming by irrigation is so easy and so certain that prosperity is sure to attend the efforts of any farmer who is at all industrious and economical.

The Staple Crops are: Wheat, Oats, Barley, Alfalfa, Potatoes, Sugar Beets, all kinds of Vegetables and Small Fruits, and Apples, Plums, Cherries and other tree fruits.

Let me send you free a copy of our thirty-two page book devoted exclusively to the agricultural and horticultural resources of this section of Colorado and also of Wyoming, along our lines. This book contains twenty-seven illustrations and describes the present condition fairly and thoroughly. It also gives the personal testimony of a few farmers, taken at random, from different valleys that may be cited, as the typical results of successful and profitable farming in this section. Write for free copy today.

T. E. FISHER, General Passenger Agent, DENVER, COLORADO

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Where Irrigation has Made the Farmer King!

We will quote facts and figures to show a larger yield per acre for crops in Colorado than in any other section of the country, with greater profits, cost of lands and all things considered.

We can show that stock of all kinds, cattle, sheep, hogs and horses, can be raised cheaper in Colorado and more money made on the capital invested than in any other State.

Our fruits, melons, potatoes and other products take preference and command higher prices all over the country.

Our climate and scenic attractions are unequalled anywhere.

Fine opportunities for new business concerns and manufactories.

We have **NOTHING TO SELL**, but we furnish **FREE**, on application, reliable information and literature regarding any section of the State, any product or industry, or about the State in general. State county or sections interested in, subjects you want information on, with other full particulars in first letter.

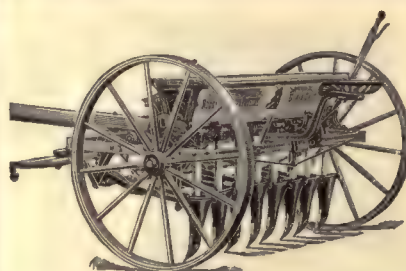
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**The Colorado State
COMMERCIAL ASSOCIATION**

DEPARTMENT E

DENVER, COLO.

The Official State Advertising and Information Bureau, eight years old, organized by leading men in Colorado to make known to the world the superior advantages and attractions of the State, and to aid desirable people to locate and invest in its bountifully yielding soil.



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DRILLS**
Plain
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Fertilizer

HOOSIER HOE DRILLS HAVE BEEN STANDARD
FOR MORE THAN 50 YEARS

Made by

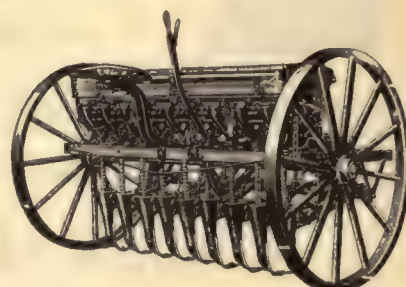
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Supplied
in all
Styles and
Sizes.

Grass Seed
Attachments
May Be
Added.



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Twenty-fifth Year

THE IRRIGATION AGE

VOL. XXV

CHICAGO, NOVEMBER, 1909.

No. 1

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

SUBSCRIPTION PRICE.

To United States Subscribers, Postage Paid, \$1.00
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In forwarding remittances please do not send checks on local banks.
Send either postoffice or express money order or Chicago or New York draft.

Official organ Federation of Tree Growing Clubs of America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 25 years old and is the pioneer publication of its class in the world.

To Open
Irrigation
Exposition
in Chicago.

The United States Land and Irrigation Exposition, to open at the Coliseum in this city November 20th and to continue until December 4th, promises to be one of the greatest educational institutions of the day. The original idea of this exposition was to attract the attention of the people in central and eastern states to the possibilities of the West. This plan has been foremost in making the arrangements for the coming show.

It is estimated by the Tribune Company, having the exposition in charge, that there will be an attendance of at least 300,000 people. It is assured that those people who visit and study the exhibits carefully will do much toward advertising the West by explaining what they have seen to friends and neighbors.

The Tribune has been liberal in its expenditures and is entitled to much credit for the manner in which the preparations for the show have been handled.

It remains to be proven that their estimate is correct, although the West trusts that their expectations may be fully realized.

THE IRRIGATION AGE will be represented by a booth on one of the main aisles, and its many friends are invited to call and make themselves at home. Many thousands of sample copies of this issue will be distributed during the time of the Exposition, and will, no doubt, greatly increase its paid circulation.

Irrigation
Age Has
Twenty-fifth
Birthday.

Even as the Spirit of the West disdains the honor of custom and of precedent to battle with difficulty and attain the glorious fruits of future success, so has THE IRRIGATION AGE struggled with adversity and obstacle to reap the reward of fidelity in a chosen field. Its editor has so long assimilated western ideas and associated with those red-blooded, clear-brained conquerors of the desert that his heart throbs in accord with the pulsating energy of the empire beyond the plains.

But though the heart and eye be turned to the future with its millions of happy homes 'neath the cloudless blue heaven, there are at times unconquerable forces that compel a moment of pause and reflection. Our readers will pardon the backward glance—for THE IRRIGATION AGE has passed the quarter-century stone, and after a rough and stormy journey gazes into the smiling valley of future years where its full power may be exerted for the human race. Time has demanded her toll of recollection and remembrance.

Twenty-five years—a mere falling of a grain in the great hour-glass of time—yet how potent in the industry of American reclamation. What Alladin's lamp has been rubbed to make the genii appear and change the face of nature, to create millions of bounteous acres where there was desert? Whence came this magic, this fairy Goddess to wave a wand and in a twinkling to re-

create a barren, repulsive wilderness. Is it real? Must we awaken from the spell to view again the rigid horizon of a trackless waste, a cluttered field of sage brush, a spiny ocean of cacti?

But listen, and from the new born Arcadia there rises the busy hum of industry, the crunch of iron wheels, the rumble of harnessed waters and the thousand other sounds of human being. Look, and as far as the eye can penetrate there nestles between the bounteous fields, rank upon rank of happy homes breathing into the air their perfume of comfort, plenty, happiness.

It is real. It is a transformation in which the dreams of the past have created the reality of today. It is a God's work, for it has added to the sum of human enjoyment. Reckoning not the motive, the great book of life must credit beneficent achievement to the human magician. What though he gain glory and affluence for himself, he has brought profit and prosperity to his fellow men. He has created, not diverted, his wealth.

Yet in this contemplation of the beautiful and serene, there strikes upon the ear a discordant wail, ever growing in volume with each succeeding turn of the hour-glass. Humans are at the torture stake in the great cities, with their dirty tenements and their squalid basements. Sunshine, pure air, more land, are needed for this generation and its progeny. Else in this maelstrom of vice and crime begot of evil environment, the life of a nation may hang in the balance.

The reclamer's work is barely begun. Brains, capital, energy—all are required in this fight against a perverted nature. Already the trail has been blazed, and he who dares to enter the lists gains for himself honor and influence, and for humankind a better knowledge of divine blessings.

At this, the twenty-fifth milestone in its journey, THE IRRIGATION AGE pledges itself to continue its firm support to all legitimate work in the reclamation of desert land. It is with a feeling of pride that the editor reviews the life-history of his publication and knows that in his strict adherence to truth of statement and honesty in purpose he has assisted in the upbuilding of a nation. Allied with no predatory interest and influenced by none but its own opinions, THE IRRIGATION AGE will continue its fearless championship of the cause of Reclamation, and will yield to no coterie of individuals or body politic that tends to hinder or obstruct the work of making the "Desert Bloom as a Rose."

Northwest Oklahoma Discusses Irrigation.

News reports of the past month give an account of an enthusiastic meeting held by delegates from several counties in northwestern Oklahoma for the purpose of inciting state and national interest in local irrigation projects. Oklahoma feels, and the belief is not unfounded, that the mam-

moth reclamation works by the government in many of her neighboring states of the west, have led to her partial, if not entire, neglect. With all the resources at her command she is ready to protest against this lamentable condition of affairs.

Reviewing the present situation as relates to funds for reclamation purposes, it is found that the revenue from the sale of state lands now aggregates approximately \$5,600,000. Of this amount it is required by law that at least one-half be expended on irrigation projects within the state. Since this large fund has been lying idle for a considerable period, and during this time certain sections of the state have suffered from lack of rainfall, it cannot be denied that land owners have reason for a vigorous protest.

Chief among the speakers at the recent congress in Woodward, Okla., was Congressman Dick Morgan. In his speech he indicated that inefficient laws and lack of a proper state department for the adjudication of claims had prevented private investors from beginning operations. Promptly on hearing this plain statement of the case delegates, already organized into the Northwestern Oklahoma Irrigation Congress, adopted resolutions calling upon the governor for action in the direction of the creation of a department of irrigation, and upon congressmen and senators for co-operation in securing the immediate attention of the United States Reclamation Service.

After disposing of its work in the direction of irrigation the convention turned into other channels and before adjourning gave attention to the commercial and industrial needs of this section of the state. By encouraging the construction of railroads and the location of industries, northwestern Oklahoma proposes to enjoy a development commensurate with its natural resources.

Colorado Usurps Wyoming's Rights.

From southern Wyoming, where the restless Laramie tumbles through the mountains on its northward journey, comes the din of preparation for a short journey along the war path. Colorado has stepped on its neighbor's toe and the red blood of the victim is kindled.

Years ago certain irrigation companies in Wyoming appropriated the waters of the Laramie river to such good purpose and with such expediency that the available supply has been exhausted and the state has refused further grants.

Now comes along a band of daring promoters and proposes, under the laws of Colorado, to file on the waters of this stream before it leaves the state.

State Engineer Johnston, of Wyoming, has not been caught napping and has addressed a letter to irrigators indicating what steps should be taken to pre-

vent the proposed diversion. He advises that the controversy should be thrown into the United States court, and his Wyoming constituents are wise enough to know that a step in time saves the other point in law. They prefer not to await the day when Colorado companies shall have begun operations and the decision of the court must involve tangible property.

**"Into
Little
Pickles
of Money."**

In a recent interview as published under copyright in the Washington Times, James J. Hill, the versatile railroad builder, took occasion to utter several truths regarding the government reclamation service. In his usual terse and explicit language, Mr. Hill reviewed the present situation in this department as follows:

"When the government went into the irrigation business, taught, I am proud to say, by the railroads, which at their own cost initiated the work and educated the people in a knowledge of its importance, the reclamation service did not divide its resources into little pickles of money and spend them in laying in a few stones of a dam in each one of all localities where lands were to be irrigated. It arranged projects in the order of their importance, engaged its engineers and spent its funds upon a few of them at a time, and thus it achieved great practical results."

From his keen understanding and his policy of forming an intimate acquaintance with the details bearing upon development, Mr. Hill would probably be able to make other and even more trenchant criticism of the government service, past and present, if he so desired.

**Schemers
Assail
Bond
Issue.**

Is the government reclamation service, crippled in its progress by the improvidence of a former administration and by reckless incapable heads, soon to become a buffet in the hands of political tricksters, a butt for chicanery and intrigue?

Few among those thousands who have greeted President Taft during his rapid progress through the west have paused to reflect upon the real motives for his strenuous journey and his Herculean task at speech-making. It was more than a social visit; it was a brave struggle to regain the confidence of the west and turn its heart from the worship of false gods and its tongue from the rehearsal of false teachings.

Powerful political interests are today bending their every energy to discredit the president's policies. His Secretary of the Interior became the first object of attack and the tricksters chuckled as the press seized upon the "water power trust" logey to hurl their broadsides of unwarranted abuse at Mr. Ballinger. An irrigation congress and two conservation congresses gave

the rostrum to a government employe who, under the guise of a plea for forestry preservation, threw broadcast his seditious utterances against the present administration.

Failing in this nefarious scheme and daring no longer to play upon the credulity of the west, this trickster hurried to a conclave of his fellows in the east. Minister Crane's summary recall and dismissal from the diplomatic service supplied ammunition for an attack upon Secretary Knox.

Then from Spokane flashed the president's speech on conservation and his pledge to advocate the issue of \$10,000,000 in government bonds for the prosecution of work on reclamation projects into which the government is recklessly plunged by an extravagant and improvident predecessor.

Before the president's speech was twenty-four hours old his enemies had concluded their plans. Newspapers in the east, ignorant of the nature of this proposed bond issue, raised the howl of paternalism and sectional favoritism. From states wherein reclamation by drainage has been discussed, came caustic criticism of the president's pledge.

Western admirers of Ex-president Roosevelt and his policies cannot fail to condemn these disreputable attempts of third term boomers to embarrass and harass the present administration. President Taft has pledged his effort toward the \$10,000,000 bond issue for the prosecution of dilatory reclamation work. It is not a loan of funds, it is a loan of credit by the government to remedy the evil resulting from its own indiscretion. New hope has been born in the breasts of those settlers who have invested their savings in land on government irrigation projects, and if the plan matures the great sum of food production will be increased.

Can a band of political tricksters create a strife that shall retard the west and deprive it of the mere loan of financial credit?

Open criticism may be consistently directed at that past administration wherein the young and inexperienced, possessing energy but not wisdom, were permitted free rein to project and enter upon vast engineering works for the completion of which there were neither present nor prospective funds. As a demonstrative stage-dance with the lime light of publicity playing incessantly upon the actors and with public favor ready to spring into rapturous applause at each new gyration, the former administration was a pleasing drama. But since it is found that the box-receipts were insufficient to the cost of the performance, the American public is awakening from its spell.

Must the poor settler, the easterner who was led by fair promises to settle upon government land, suffer for this wanton deception? He invested his meager earnings in government land under the irrigation

project. Possibly he has watched the bureaucratic red-tape unwind and extend itself until land that he thought himself buying at \$20 per acre has been advanced to double that figure—and still he has no water to raise crops. Should he be the victim?

There is a deeper import in this problem than merely the national purse. A nation's honor and integrity are at stake. And the prayers for aid come not from the "heathen across the sea," but from citizens of the United States, whose confidence and trust have been outraged.

In the light of recent developments it can be plainly discerned that eastern trade barons seek to dominate in the financial as well as the commercial affairs of government. Whether from knowledge or ignorance, the band of "Third Term Boomers" is lending its every assistance to these machinators.

Westerners who allowed themselves to be worked into a fury by recent declarations of a government employe that there is in existence, or about to be formed, a water power trust, are innocently playing into the hands of their enemies and are thereby adding power to those interests that declare government bonds for the completion of reclamation works shall not issue.

Let the west crush those false friends who seek its endorsement from the rostrum of its conservation congresses, and then slyly barter its support in the dens of political schemery.

**Pueblo
Appoints
Board of
Control.**

In its initial moves for the preparation of the Eighteenth National Irrigation Congress, and the accommodation and entertainment of its thousands of visiting delegates, Pueblo promises well. There is a spirit of energy and far-sightedness about the preliminary steps that indicate the general reputation of enterprise to which Pueblo has already fallen heir among even its western neighbors.

Early in October the committee of business men, selected to appoint a governing board for the congress, made their report, and it was found that many of the most prominent citizens had cheerfully agreed to assist in the work. At a subsequent meeting of the executive committee it was decided to organize in order to handle the affairs of the congress with greater facility and dispatch. Officers chosen were: Chairman, J. H. McCorkle; vice-chairman, A. G. Watson; treasurer, Alva Adams; secretary and manager of publicity, R. H. Faxon. A committee was appointed to draft articles for formal incorporation under the state laws.

It is probable that no former board has entered the field with equal preparation and understanding to that of the Pueblo body. Delegates to the last congress realized that Pueblo was intent upon capturing the

eighteenth convention, and that it would produce its best efforts in the encouragement of world wide interest in the sessions.

Men selected for membership on the board of control are of large mental caliber, and their names insure success in the undertaking. Mr. Faxon, who will act as secretary, has already demonstrated his ability as a master of publicity. Officers of the executive board are substantial business men who may be expected to give earnest and constant attention to the duties they have willingly assumed.

Early in January the board will open its offices in Pueblo. From that time until the date of the congress it is anticipated that the eastern world will hear various and sundry noises issuing from the state of Colorado.

Warning.

Information from various sources proves that plans are on foot to exploit irrigation projects of questionable merit. The reports show that numerous companies have been formed in the West for the express purpose of selling land to residents in central and eastern states on the weekly payment plan. THE IRRIGATION AGE advises its readers to be cautious in investments of this character.

There are many points to be considered in judging the value of an irrigation project. The question of sufficient water supply associated with that of good soil is most essential to the development of any project. Those who contemplate an investment of this character should take ample time to study the question thoroughly. The fact that the land can be bought on small and easy payments is no proof that the soil is good, nor does it guarantee sufficient water.

People who have made a close study of the subject, know that the basic value of bonds must be scrutinized closely. One prominent operator who has financed several successful enterprises in different parts of the west, makes the bold statement that many of the promoters who are trying to float irrigation bonds are traveling toward the penitentiary. This is rather an alarming statement and the IRRIGATION AGE hesitates to exploit expressions of this character in the fear that by so doing the legitimate irrigation bond business may be injured.

It is the intention of this journal in the future to carefully investigate the basic value of all bonds issued upon newly developing tracts, and to give, so far as is within its province, correct information regardless of the firm acting as sales agent.

It is the opinion of the editor of this journal that it is better to warn its readers now than to condole with them after their money is irretrievably lost. THE IRRIGATION AGE reiterates that it will surely expose any combination of men who are attempting to sell these securities by false representation.

**"Notes on
Practical
Irrigation"
Monthly.**

Realizing the fact that many of the new subscribers to *THE IRRIGATION AGE* in both the east and the middle west, are perhaps turning their first attention to this subject and are not familiar with the fundamentals of scientific agriculture and applied irrigation, it seems advisable that there be reproduced in the columns of this journal a work on this subject that has already enjoyed an immense sale and has proven itself a mine of information to all who have read its pages.

Under the caption, "Practical Notes on Irrigation," there will be reproduced in the columns of *THE IRRIGATION AGE* during the ensuing twelve months a series of comprehensive extracts and excerpts from the "Primer of Irrigation," as published and now placed on the market by D. H. Anderson, editor of this journal.

For the information of those readers who are seeking a knowledge of irrigation it may be stated that this work, already adopted as a complete text-book on the subject, contains elemental facts relative to the character of soils and plant foods existing therein. In successive chapters the reader is informed as to the relation of water to plant life and the origin and peculiarities of arid and semi-arid lands. From these basic principles the reader is carried into the field of irrigation and given instruction in the method of laying out land, handling the water supply, providing for proper drainage, the measuring of water and other kindred subjects of equal importance.

For many years the publisher of this book has made a study of irrigation and crop culture where water is supplied to the soil by artificial means. In the preparation of copy especial attention was given to the phraseology in order that the work might be thoroughly intelligible to the reader.

In planning for the re-publication of this book in monthly installments the editor believes that it will be of benefit not only to those who are now entering upon the study with a view to making homes in the west, but that it will be of assistance to those land owners in irrigation projects who have heretofore depended upon information acquired from hearsay or from another's experience and are therefore still unacquainted with the elementary facts underlying this knowledge.

**Western
Slope
Write-Up
Delayed.**

Through a misdirection and consequent loss of a portion of the matter designed for use as a special write-up of the "Western Slope" in this month's issue of *THE IRRIGATION AGE*, it has been necessary to hold this article for the future. One of the editors of the *AGE* has spent several weeks in that section and has secured much valuable data that will prove of interest to readers.

The Banker's and Investor's Opinion of Irrigation Securities

The West has the opportunities and wants money
—the East has the money and few opportunities.

Are irrigation bonds the investment opportunity of the East?

This letter from Mr. George E. Roberts, president of the Commercial National Bank of Chicago and Ex-Comptroller of the Currency, seems to cover the subject rather fully:

"Regarding our attitude towards irrigation bonds, we would say that in our opinion the developments of the last five years have demonstrated that the irrigation of arid lands in the West is destined to add largely to the country's annual output of food products, of which there is apparently no longer any danger of over-production. We regard these irrigation projects, therefore, where properly conceived and carried out, as perfectly legitimate enterprises, and irrigation securities issued under such conditions are entitled to rank with real estate mortgages. It goes without saying that both the engineering and management of the finances must be in experienced and responsible hands."

From another view point the following extract taken from a letter written by Mr. John Farson, of Farson, Son & Co., bankers, New York and Chicago, is interesting:

"I give it as my deliberate judgment and after most careful examination that properly issued irrigation bonds have more security back of them than any bonds I have ever sold. I unhesitatingly recommend them to my most conservative clients."

The rapidity with which irrigation bonds have grown in popularity with conservative investors throughout the whole United States is most pronounced. This article is the result of an investigation into how and where the large number of irrigation bonds that have been offered the public during the last few years have been absorbed. The comments of the various financial journals of late have been to the effect that the market for the older securities was very soft, but that securities of the irrigation bond class were being absorbed very rapidly by the bond buying public. From every side the evidence that these securities have found a market pours in. For this reason it was particularly satisfactory to know exactly the class of investors that were buying these bonds. In other words the opinion of the banker and the investor regarding these securities is best evidenced by their buying them.

The result of a canvas of representative banks, trust companies, insurance companies and fraternal organizations of the United States disclosed the fact that the majority of these institutions already held securities of this class. Further it was discovered that those large investors who had not already purchased were making a definite and thorough study of the subject with a view of purchasing in the immediate future. Such evidence as this proves conclusively that irrigation bonds are meeting with the approval of the most intelligent investors and that they are well established today in the minds of the bankers and investors of the United States.

**Brief
History
of These
Securities.**

It is a most wonderful and rich empire that is being created out of these arid western plains. So positive and immense have been the values that have been created during the last few years by irrigation that the conservative East would not at first believe the reports as they came. However, there were a few financiers of discernment who went out over this country and made thorough investigations into these new values. These men brought back with them the whole story and today it can safely be said that of all the newer securities that are being offered the public irrigation bonds properly issued and properly safeguarded are the most acceptable to the banks, insurance companies, trust companies and fraternal organizations and private investors of the East.

Accordingly we cannot mark this popularity without comment. It is deserved, for the values behind these bonds are large and the ratio between the loans and the values are much more attractive than those farm mortgage loans which we, in the East, are familiar with. As a matter of fact irrigation bonds when analyzed are nothing more nor less than farm mortgages. They go farm mortgages one better however, because the largeness of the total issue means the placing of the loan in many hands, thereby making a market and tending to convertibility of the investor's assets.

**Investor in
Irrigation
Securities
Safeguarded.**

The Western States have greatly benefited in their development during the last few years by the various laws which have been passed to encourage the rapid development of the country and to attract and protect the Eastern investor. The first of these laws was the Carey Act, the second the Reclamation Act, and lastly most of the Western States have passed laws by which Municipal Irrigation Districts can be organized.

These last named bonds are perhaps the most popular at the present time for the reason that they are a pure municipal obligation. The bonds are voted by the freeholders of the district in the same manner as are the school and paving district bonds with which we are all familiar. The bonds are payable from taxes which are levied by the county assessor and collected by the county treasurer on the same extension with the other general taxes of the county.

The following letter from Hon. Charles D. Hayt, former justice of the Supreme Court of Colorado, concerning this particular class of bonds is very pertinent. It shows how thorough has been the work of the financiers whose names are so closely connected with this great development of our Western country:

"Answering your inquiry as to my opinion concerning irrigation securities, I will say that I have had a great deal to do with such securities in recent years, particularly as to the class known as irrigation district bonds; and from such experience will say that I regard such bonds as among the best and safest securities that have been placed upon the market, as such bonds are used for the purpose of supplying the lands in the district with water rights and with a system of reservoir for storage and ditches to distribute the water upon lands in the district. In other words, the investor, in addition to the security upon the land, has the additional security upon the property created as the result of the bond issue.

"The law was framed in the first place to attract conservative eastern capital, and also to make the payment of the principal and interest convenient and easy to the

land owners. Experience to date has proven the law to be very satisfactory. I see no reason why these bonds are not equally as attractive to the investor as those other bonds which are usually designated as A-1.

"The principal questions the investor should satisfy himself upon are the water supply and the legality of the bonds. The water supply should be passed upon by some irrigation engineer of experience and established reputation, and the investor should satisfy himself that a reliable authority has passed on the complete procedure leading up to and authorizing the issue of the bonds."

**Caution to
Buyers of
Irrigation
Bonds.**

One cannot deal with a subject of this kind from the banker's view point without a word of caution. An old maxim of conservative bond buyers is—"Bonds should only be purchased from conservative and reliable institutions." This is basically true concerning irrigation bonds. Considering the income return as indicated by the general market for these securities there is no more attractive purchase among any bonds than the irrigation securities being offered the public. For this particular reason the investor should stop and consider his security very carefully.

It would be impossible to conceive that every irrigation project in this Western country would be a success. As in all business ventures experience has proved that there must be a certain percentage of failures. There is also a tendency when a certain line of investment is proving attractive to investors for the less responsible and promotional institutions to take advantage of the public sentiment as a whole, and often securities will be brought to the public that are weak and do not even merit attention. In fact the older and better known institutions throughout the country are flooded today with unfeasible irrigation projects.

And so the investor must look to his investment along this line as in every other line and the questions that he must ask are the following, and if each of these questions are not well answered he will do well to let the security in question alone.

First—Is the water supply ample?

Second—What is the effect of water on the land?

Third—Where is the land located, has it a market for its crops, what are the railroad facilities?

Fourth—Is the land already sold and owned by the people who will farm it, or is it subject to future colonization?

Fifth—What is the character, reputation and experience of the banking institution offering the bonds.

If these questions are well answered there can be no doubt of the immense value in back of the bonds. In such instances the security will run from six to ten times the amount of the indebtedness represented by the bond issue. Surely this is ample protection to the investor. The investing public appear to have arrived at the position where they appreciate these values. It would seem that irrigation bonds were the investment opportunity of the East.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 280-page finely illustrated work for new beginners in irrigation.

Notes on Practical Irrigation

D. H. Anderson

SOIL IN GENERAL.

Its Formation, Characteristics and Uses—Fertility and Sterility.

The mere planting of a seed in the ground is not sufficient to insure its growth or development into a useful or profitable plant. This fact is well known to everybody, but what is not so well known is, the reason or cause why a seed grows up into a vigorous plant capable of reproducing seed similar to the one from which it sprang, and how it does it.

There are certain elements which are essential to the growth of every plant, the development of every germ, for without them it cannot live; these are heat, light, air and moisture. A few grains of wheat discovered in the coffin of an Egyptian mummy after three or four thousand years' deprivation of the four essential elements, were found inert, that is, they were not alive, neither were they dead, for upon giving them the essentials above referred to, the wheat sprang into life and produced a plentiful supply of grain.

Still, notwithstanding the necessity of heat, light, air and moisture, plants cannot flourish without proper food. In this respect plants are similar to animals. Among animals there is no universal specified diet, some eating one kind of food, others another. We see many that eat flesh exclusively, others whose sole diet is insects. Certain animals eat herbs and grass, others grain, and when we reach man we find an animal that will eat anything and everything; hence we call man "omnivorous."

It is the same with plants, some devouring in their fashion a certain kind of food, some another, and so on all along the list. Plants are substantially like animals that possess a stomach; they eat and digest, absorb and assimilate the food they obtain. If the plant is not furnished with its proper food, or if it is prevented from obtaining it, it shrivels, droops, withers and dies just like an animal that starves to death.

Plant Instinct for Food.

There is another striking resemblance between plants and animals, which is the instinct and power to seek food. The plant being a fixture in the soil, cannot, of course, "prowl" about in search of food, but it throws out roots, fibers and filaments in every direction, its instincts reaching in the direction of food as surely and with as much certainty as the nose of an animal scents its prey of the eye of an eagle sees its quarry. Not only does the plant seek food beneath the surface of the earth, but it thrusts shoots, branches and leaves up into the atmosphere for the purpose of extracting nourishment there also.

It is, however, from the soil that plants receive the principal supply of food necessary for their development, hence an acquaintance with its chemical and physical properties is important in helping us to understand the nutritive processes of plants and the operation of agriculture.

Volumes of books have been written on the general

subject of agriculture, but they are more adapted to soils upon which falls sufficient rain to dissolve the salts necessary to produce a crop. In a book devoted to irrigation, the principles of agriculture and the adaptation of the various elements of plant food in the soil are all the more important, as the water employed in irrigation—which is nothing but artificial rain—is absolutely within the control of man, and not dependent upon meteorological uncertainties. One fact should, however, be constantly borne in mind by the practical irrigator, that pure water is absolutely sterile so far as plant food is concerned, and if poured upon a pure soil, which is also sterile, there can be no crop of any sort raised. A remedy for supplying a defect of plant food in irrigating water will be given in detail in another chapter, the scope of this chapter being limited to soils that contain plant food, or are arable, in which case the quality of the water is of secondary importance.

Origin of Arable Soil.

Arable soil owes its formation to the disintegration of minerals and rocks, brought about by mechanical and chemical agencies. The rock may be said to stand in about the same relation to the arable soil resulting from its disintegration as the wood or vegetable fiber stands to what is called the humus resulting from its decay. To be fertile, however, the soil must contain disintegrated vegetable matter. There is no fertility in a heap of sawdust, nor is there in a heap of powdered rock; indeed, the two might be combined and still remain sterile, it is only after both have been disintegrated by chemical or mechanical action that they become plant foods capable of nourishing and maintaining plant life.

From this it results that soil consists of two grand divisions of elements: inorganic and organic. The inorganic are wholly mineral; they are the products of the chemical action of the metallic or unmetallic elements of rocks. They existed before plants or animals. Life has not called them into existence, nor created them out of simple elements. Yet these inorganic mineral elements of soil become part of plants, and under the influence of the principle of life they no longer obey chemical laws, but are parts of a living structure. Through the operation of the laws of the life of the plant, these mineral elements become organic and so continue until death comes and decay begins, when they return to their mineral form.

Organic elements are the products of substances once endowed with life. This power influences the elements, recombines them in forms so essentially connected with life that they are, with few exceptions, produced only by a living process. They are the products of living organs, hence termed organic, and when formed, are subject to chemical laws. The number of elements in the inorganic parts of soil is twelve: Oxygen, sulphur, phosphorus, carbon, silicon and the metals: potassium, sodium, calcium, aluminium, magnesium, iron and manganese.

The number of elements in the organic parts of soil does not exceed four: Oxygen, hydrogen, carbon and nitrogen.

The great difference between these two divisions is, that while the inorganic elements are combinations of two elementary substances, the organic are combinations of three or four elements, but never less than two. These three elements, however, are variously combined with the other elements to form salts which enter into the great body of vegetable products, in fact they are continually

changing, the mere change of one element, or its abstraction, forming a new product. It is this susceptibility to change and the constant assumption of new forms by vegetable products which is the foundation of tillage, and the essence of the knowledge of irrigation.

How Plants Feed.

We do not know and we may not understand what life is, nor how plants grow, but it is a knowledge which comes to the most superficial observer that all plants feed upon various substances their roots find in the soil, which substances are called "salts," and they are prepared for the uses of the plant by the action of organic matter on the inorganic or vice versa. That is to say, vegetable matter combines with decomposed rocks or minerals and forms a plant food without which the plant cannot live. We know as a fact that the silicates or rock elements and minerals or metallic salts compose all the earthy ingredients of soil, and are always found in plants, the ashes of any burned vegetable or plant showing this. But these silicates and salts do not make fertility in soil. Fertility depends on the presence in the soil of matter which has already formed a part of a living structure, organic substances, in fact. It is this matter which causes constant chemical changes in which lies the very essence of fertility. To make this quite clear, it will be sufficient to refer to the fertility in the valley of the Nile in Egypt, caused by the overflow of the river and the deposits, upon the silicates and minerals or metallic salts, which in plain language means the sands of the desert, of a layer of mud containing decomposed vegetable or organic matter. The consequence is, chemical action takes place and a rich harvest follows. The result would be the same in our arid plains, where the soil contains all the ingredients necessary to plant life, but the element of moisture to dissolve and unite them is absent. Here irrigation creates fertility. The oxygen and the hydrogen in the water supplies the soil with the elements it lacks to manufacture plant food.

Plants Induce Chemical Changes.

There is a curious, not to say mysterious, fact connected with the transformation of the organic and inorganic elements in the soil into plant food, and that is, the chemical change does not take place except through the intervention or agency of the living plant itself. It is life that is necessary to the process and this life of the plant gives life to the inert elements around it. The mere presence of a living plant gives to the elements power to enter into new combinations, and then these combinations occur in obedience only to the well-known, established, eternal laws of chemical affinity.

If, on a dry day, a wheat or barley plant is carefully pulled up from a loose soil, a cylinder of earthy particles will be seen to adhere like a sheath around every root fiber. This will be also noticed in the case of every plant. It is from these earthy particles that the plant derives the phosphoric acid, potash, silicic acid and all the other metallic salts, as well as ammonia. The little cylinders are the laboratories in which nature prepares the food absorbed by the plant, and this food is prepared or drawn from the earth immediately contiguous to the plant and its roots. This demonstrates the importance of the mechanical tillage of the ground. Cultivated plants receive their food principally from the earthy particles with which the roots are in direct contact, out of a solution forming around the roots themselves. All nutritive sub-

stances lying beyond the immediate reach of the roots, though effective as food, are not available for the use of the plants; hence the necessity of constant tillage, cultivation of the soil, to bring the nutrition in contact with the roots.

Formation and Use of Earth Salts.

A plant is not, like an animal, endowed with special organs to dissolve the food and make it ready for absorption; this preparation of the nutriment is assigned to the fruitful earth itself, which in this respect discharges the functions performed by the stomach and intestines of animals. The arable soil decomposes all salts of potash, of ammonia, and the soluble phosphates, and the potash, ammonia and phosphoric acid always take the same form in the soil, no matter from what salt they are derived.

It is essential that these "salts," as they are called, should be understood, for without them there can be no fertility. Unless these "salts" exist in a soil in certain quantities the organic elements, or what are known as "humic acids," are insoluble and cannot be absorbed into the plant through its roots, and so there can be no fruit or vegetable. Yet there is such a thing as an excess of these same salts, and then there is barrenness. A common illustration of which may be seen in what are termed "alkali lands," which will be treated in detail in another chapter.

To simplify an acquaintance with these various salts, we shall divide them into three general classes, depending upon the acids formed from them, all of them nutritious to plants.

First—Carbonates.

Second—Nitrates.

Third—Phosphates.

The carbonates compose a very large portion of the salts used in agriculture, and include limestone, marble, shells. These salts are set loose from the rock, that is the decomposed rock already alluded to, by the action of the living plant, and their business is to dissolve, or render soluble, the organic matter in the soil, so that the plant may absorb it through its roots. When there is an excess of these salts, or of lime or alkali, the organic matter is rendered insoluble, that is, the plant cannot absorb it, and then the soil is barren. There are, however, certain plants known as "gross feeders," which flourish in such soils, but of them more will be said in another chapter.

The second class of nourishing salts is the nitrates, and includes saltpeter, nitrate of potash, nitrate of soda, and all composts of lime, alkali and animal matter. This class of salts produces ammonia which hastens the decay or decomposition of the organic matter, and prepares it for absorption by the plant. All the nitrates act under the influence of the growing plant and yield nitrogen which is essential to its life, indeed, if there are any salts which can be called vegetable foods, they are the nitrates, and they hold the very first place among salts in agriculture.

Fertilizers Contain Phosphates.

The third class of plant nourishing salts is the phosphates. They are found in bones, liquid manure, and in certain rocky formations which are abundant in the United States, and ground up, are largely used upon land to add to its fertility and increase the supply of plant food.

(Continued on page 48.)

Thirty Millions of Acres Yet Reclaimable

C. J. Blanchard, Statistician U. S. Reclamation Service

Within the last three years approximately three million acres have been added to the cultivable area of the United States by the Reclamation Service and large corporations engaged in reclaiming the desert. It is estimated, as a result of these activities, that not less than 30,000 families are now living on farms of their own in this new region, and probably an equal number of families are supported in the cities, towns and villages which have come into existence in the new agricultural districts.

The work is still only in its beginning. Conservative engineers have fixed the reclaimable area at thirty million acres. On the basis of the intensive system of farming which is being prac-



C. J. Blanchard.

to most of the people who dwell east of the Mississippi has suddenly come into prominence as a land of golden opportunities and a large influx of settlers has followed. An enormous amount of money has already been expended by the Government and by private enterprise to make habitable many fertile valleys in the West. New communities are springing up in the arid states and territories so rapidly that it is difficult to keep pace with the development. An especially interesting and cheering phase of the growth of these communities is the splendid class of citizens who have established themselves in the new country. They are largely the young, vigorous and intelligent descendants of the pioneers of the Mississippi



Finished Portion of Main Canal on Lower Yellowstone Project, Montana.

ticed in the irrigated region, this vast area when watered will provide homes for a million families on the land. Another million will find homes and employment in the urban communities which spring up in the midst of the new farming country.

Rapid as has been the development of the desert West, it has not kept pace with the increasing demand for homes. Notwithstanding the opening up to settlement of millions of acres of irrigated land and land adapted to dry farming, the undesirable efflux of our best citizens to Canada has continued. It is a most important function of the public press, and one which should not be neglected, to make known the almost unlimited opportunities in the West for homebuilders.

The West which has remained so long terra incognita

Valley who have been crowded out of the thickly settled agricultural districts by reason of the growth in population and the high price of farm lands. They represent the best and most progressive citizens of our country, and their coming to the West predicates the upbuilding in an incredibly short time of agricultural communities which will be as nearly ideal as can be found anywhere in the world.

The Great American Desert is vanishing from our maps. It is being replaced by wide vistas of green fields and blossoming orchards. Across its broad bosom railroads and trolley lines are being extended, and cities, towns and villages are springing up. In its sunny atmosphere an optimistic and energetic people have begun to

erect their homes and to wrest prosperity and a future competence from a region long vacant and voiceless.

To meet the steadily increasing demand for homes on the land, the Government is extending its irrigation works as rapidly as the funds will permit. On a few of the great projects there are farms remaining which are open to homeseekers under the liberal terms of the reclamation act. For the information of a very large class of homeseekers, a brief description of several of these large projects is appended.

Shoshone Project, Wyoming.

The lands in this project were opened to settlement



New Settlers Clearing Land and Burning Sage Brush.

on May 22, 1909, and are rapidly being taken up. About one hundred farms are still available. These farms, as a rule, are level, requiring no expense for clearing. They are near towns and within easy distance of the railroad. In size they range from 40 to 80 acres, depending upon nearness to towns. The farms have been platted in such



Wheat Crop, Heikes & Skinner Ranch, Sun River Project, Montana.

a manner that there are eight farm houses along each mile of the main highways, thus contributing to neighborliness and eliminating loneliness. In the brief period of four months the country has taken on an appearance of a suburban community. Here is a region possessing

an equable and healthful climate, a fertile soil adapted to a wide variety of crops, with coal and oil in the near neighborhood, and with excellent transportation facilities. This season's crops warrant the prediction that the Shoshone region will become in a short time one of the most prosperous farming districts in the Northwest.



Shoshone Dam, General View of Dam Looking Up Stream, Shoshone Project, Wyoming.

Huntley Project, Montana.

Situated in the southern part of Montana, in a part of the valley of the Yellowstone where irrigation has been practiced successfully for many years, the Huntley project offers many advantages and attractions to the homeseeker and to all classes of professional and business men and mechanics. More than three hundred families are now established in homes on this project, several thousand acres have been put in crops, and the growth of the new towns is keeping pace with the agricultural development. With two transcontinental railroads traversing the entire valley, no farm is more than two and one-half miles from a shipping station.

Agricultural experts predict that apples and other hardy fruits will become important wealth producers in this section. All the crops of the North Temperate zone do well here. Iowa, Illinois, Minnesota and Nebraska have contributed some of the best blood and brains to the development of this project with exceedingly gratifying

(Continued on page 52.)

NORTHWEST OKLAHOMA WANTS IRRIGATION

Delegates From Six Counties Ask State to Assist Private Irrigation Projects—Government Will Help.

Stirred to action by the partial failure of crops in the past year and their consequent inability to place dependence upon the rainfall, land owners in the northwestern part of Oklahoma have framed an urgent appeal to United States reclamation officials for the commencement of irrigation operations in that section of the state.

Accredited delegates from several counties met at Woodward during October and held a convention that for enthusiasm was characteristic of the west. Permanent organization was formed, resolutions were adopted, and in the spirit of positive action the convention framed a request to the governor for a special session of the legislature to provide proper irrigation laws and to assist in the railroad and the industrial development of that part of the state. It is predicted that because of peculiar political conditions in Oklahoma the special session will be held.

Aside from the accredited delegates there was a large attendance of farmers and citizens who were vitally interested in the projected work. It was pointed out, during the three days' speechmaking, that the state has no department wherein affairs connected with irrigation might be investigated or controlled. The convention promptly framed a petition to the governor asking that a state irrigation engineer be appointed and that he be given an able staff of assistants.

Permanent officers were elected as follows: President, William Little of Harper county; vice-presidents, L. B. Lane of Woodward county, S. L. Lupton of Ellis county, S. E. Thompson of Cimarron county, E. Lee Adams of Harper county and Hugh M. Bixby of Beaver county; secretary, E. L. Roberts of Texas county; treasurer, C. A. Manns of Ellis county; delegate to the legislature, R. B. Quinn of Texas county.

After the framing of resolutions requesting early action by the government toward the construction of irrigation systems, and petitioning the legislature to pass laws under which private irrigators may outline and prosecute their operations, the Northwestern Oklahoma Irrigation Congress, as the organization is known, adjourned to meet on March 10, 1910.

Among the delegates registered at Woodward during the convention were the following:

Cimarron county: W. T. Cleaton, Boise City; William H. Guy, Kenton; H. E. Thompson, Garrett.

Ellis county: James Shaw, Chaney; I. O. McCallough, Gage; George B. Johnson, Supply.

Harper county: Oscar H. Jones, Lelton; O. G. Harper, Buffalo; E. J. Dick, Buffalo; J. R. Litz, Supply; C. W. Simmonds, Buffalo; A. S. Allison, Buffalo; E. Lee Adams, Buffalo; C. L. Torrance, Yelton; James Reckutt, Yelton; Sam Cooper, Kibby; G. B. Carpenter, Willard; Ed James, Yelton; E. B. Williams, Buffalo; J. A. Madison, Buffalo; J. E. Cooper, Kibby; L. T. Littrell, Buffalo; Sid Scovel, Fern; B. M. Thurman, Fern.

Texas county: W. L. Roberts, J. S. Fisher, P. M. Hayne, Texhoma; John F. Allison, Texhoma; R. B. Quinn, L. B. Snead, C. E. Hunter, J. J. Flannigan, F. M. Bathao, E. J. Earl, J. L. Gleason, J. Breslin, J. W. Harris, J. H. Langston, all of Guymon.

Roger C. Dahlhjelm

President of Dahlhjelm Company.

We are presenting in this issue a half-tone likeness of Mr. Roger C. Dahlhjelm, a well known irrigation promotor in the northwest. Mr. Dahlhjelm is a very young man to have achieved such great success as has come to him, being now twenty-nine years of age. His first experience in the promotion of irrigation enterprises was in 1907 when he associated himself with Mr. Lewson Bassett, of the Columbian Canal Company, who is a well known capitalist of the Pacific Northwest. In that year Mr. Dahlhjelm came east to exploit the holdings of that company, opening his first eastern land office in the spring of 1908. His success was immediate and his company sold within one year over \$600,000 worth of irrigated land in the Columbia River Valley of Washington. During the



R. C. Dahlhjelm.

past summer Mr. Dahlhjelm became associated with the Lewiston Land and Water Company of Lewiston, Idaho, and placed on the eastern market their holdings, which is considered among those who know, one of the highest class orchard tracts in America, and he has been very successful in this new venture.

Mr. Dahlhjelm's chain of offices are in most of the leading cities of the central and western states, comprising Seattle, Portland, Spokane, Winnipeg, Minneapolis, St. Paul, Des Moines, Ortonville, Duluth, Dunkirk, Lewiston, Clarkston, Springfield, Illinois; Frankfort, Kentucky, and Chicago.

The Chicago office of this company is located in the Schiller building and is in charge of Mr. Richard S. Thain. The Dahlhjelm Company, as the new firm is known, will have an elaborate exhibit of the products of the Lewiston-Clarkston district at the Land and Irrigation Exposition, which is to be held in the Coliseum, November 20 to December 4.

Irrigation Attracts Advertising Expert

Richard S. Thain, Nestor in Publicity Field, Joins Dahlhjelm Company for Exploitation of Orchard Lands.

Behind the mere statement that Richard S. Thain, a veteran in advertising experience and an acknowledged expert in matters relating to publicity methods and exploitation, is about to devote his whole attention to the sale of western irrigation land, may be found a proof that the reclamation of arid lands is gradually assuming a prominent, even a dominant position in the commercial affairs of the nation.

Mr. Thain, as proven by the high regard in which he is held by his collaborators in the advertising field, has gained for himself a reputation for aggressive, successful work. For more than forty-two years, in fact since present advertising methods have evolved from infancy to full maturity, Mr. Thain has maintained himself at the wave-top of the tide. His peculiar powers of inception and organization have brought to him not only the laurels



Richard S. Thain.

of success, but also a bank account of no mean proportions.

Realizing the full magnitude of western reclamation work, the great field for exploitation to be found in the settlement of these millions of acres, and the financial returns to be gained by the agents who induce this colonization, Mr. Thain has prepared to enter the new field and, by applying the tested rule of experience, add another success to his record.

In associating himself with the Dahlhjelm company, sales agents in the east for the Lewiston Land and Water company, of Lewiston, Idaho, Mr. Thain will become a part of an organization that has already gained an enviable name. The company, under the direction of Mr. Dahlhjelm, has already brought to successful conclusion numerous campaigns for sale of irrigated lands. By the inauguration of new methods and his steadfast policy

in accepting the sales management for only those projects in which he places his personal confidence, Mr. Dahlhjelm has gained a high place in the commercial affairs of the middle west.

Owing to the rapid accumulation of work and the steadily increasing demand for the services of his sales machine, Mr. Dahlhjelm has called to his assistance an expert in the advertising field and it can be safely predicted that this powerful combination shall become a most potent force in the development of the west.

It is announced that Mr. Thain will take charge of the Chicago branch for the Dahlhjelm company, thus relieving Mr. Dahlhjelm of active work at one of his agencies and allowing him to give greater attention to affairs in the western field.

At a recent complimentary dinner, given to Mr. Thain by his associates in Chicago, several speakers of national reputation took the occasion to commend him for the integrity and inviolable elements of character that had led to past success. The esteem in which he is held was indicated by the following from the pen of Seth Brown, editor of the Commercial Union:

"To be able to maintain for so long a period a steady, uninterrupted and beneficent bearing is indeed a grand accomplishment. There is a goodness about Mr. Thain which is not dependent upon his advertising qualifications. It goes beyond the knowledge of the technique of his business.

"Those of us who have enjoyed his personal acquaintance know what kind of a man he is. During his forty-two years of service in the advertising field of Chicago there has not been one false note to disturb the harmony of his life. There is a satisfaction and profit in the kindly consideration of other men's feelings which possibly has never been more perfectly emphasized than in the life of Richard Thain.

"So far as is known Mr. Thain has made no enemies either in a business or a social way. Possibly there is no advertising man in the United States who enjoys a broader acquaintance among the important men of the business than does Mr. Thain. He enjoys the personal confidence of Mr. Cyrus Curtis of the "Ladies' Home Journal," and in fact with every publisher with whom he was associated."

In company with Mr. Dahlhjelm and other representatives of the Dahlhjelm company, Mr. Thain recently made an extended visit to the irrigated orchard lands at Lewiston, Idaho, and Clarkston, Wash., of which the company has already made heavy sales. Upon his return he assumed his work in the Chicago offices of his company at 1206 Schiller building.

NEW HARVESTER MAGAZINE.

One of the newsiest and brightest of class journals to appear at the exchange desk in the offices of the Irrigation Age, is The Harvester World, a magazine issued under direction of the International Harvester Company of America. It is announced that in subsequent issues of the publication, will appear articles on the development of agricultural methods, general news of the trade and other matters of interest to the farm machine industry. The initial number is especially attractive and contains numerous sketches and photographs.

WYOMING

AN UNDEVELOPED EMPIRE



The most accessible lands and those that could be most easily farmed were naturally entered by the Homeseeker in the west, before any great effort was made to establish homes in the regions where natural obstacles are greater. The agricultural lands of Wyoming present some difficulties to those who desire to establish homes within the borders of the state. However, when these difficulties are overcome the lands increase in value more rapidly than they do where conditions seem more favorable to settlement. A greater variety of crops can be grown in a region where the topography of the surface embraces plains, hills and mountains. The various resources surrounding the agricultural districts build up industries which provide a first-class permanent market for all farm products. No state in the union contains varied resources in as great an extent as does Wyoming. These have been untouched until recently on account of a lack of transportation facilities. Following the recent construction of railroad lines, much development has begun which would otherwise have been very slow if not impossible.

Wyoming still remains an undeveloped empire, having a total area of 97,890 square miles, of which 10,000,000 acres will ultimately be irrigated. Wyoming stands in the front rank among her sister states in educational facilities, and in its low per cent of illiteracy. The topography of the state is as varied as are its resources. Within its boundaries are 10,000,000 acres of timber lands, 48,000,000 acres of land that will ultimately be devoted to agriculture and live stock pursuits. There are fully 20,000 square miles of the state underlaid with coal. Hundreds of carloads of iron ore are shipped each day from the mines in northern Laramie county. While Wyoming has an

elevation of 6,000 feet above the sea level, yet the climate is mild, the mean temperature being 44 degrees. Severe storms are not frequent in the winter, and the ground is generally dry during that season, and only covered with snow at intervals. It is possible to ride a bicycle or drive an automobile during practically the entire year except in the mountain districts.

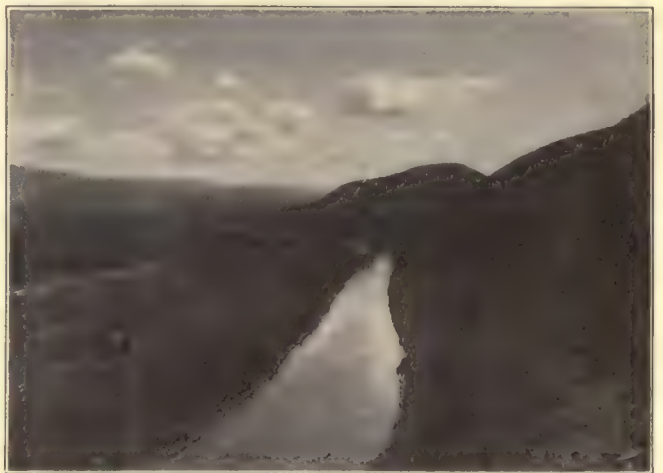
Wyoming already stands first in so far as the wool and sheep industry are concerned. In addition to the opportunities for the investment of capital in many industries other than farming, Wyoming offers the best advantages to the homesteader. The varied scenery of the state attracts thousands of tourists each year, and as transportation facilities improve many localities possessing special points of interest will be accessible to those who travel for the purpose of studying the beauties of nature.

Wyoming has an assessed valuation of \$200,000,000



The Dam of the La Prele Irrigation Company, Near Douglas, Wyoming. It Is Now Completed and Is 185 Feet High. Will Store Enough Water for 25,000 Acres.

and a population of from 130,000 to 150,000 people. The per capita wealth of its citizens is perhaps higher than any other state. Although the state has made provision



Shell Creek Canal in Big Horn County on Which Construction Has Recently Been Finished.

for the care of paupers, yet these institutions are but little used, because pauperism is almost unknown. Wyoming

(Continued on page 52.)

French Land and Irrigation Co.

French, Colfax County, N. M.

Irrigation System Is Substantially Constructed—Colfax County Orchards Have Produced for Thirty Years—Oat and Millet Yields Heavy—Sugar Beets Contain High Percent of Saccharine Juice—Active Local Demand for Vegetables—French Land and Irrigation Company Plans More Irrigation Work.

In August, 1907, this company purchased from the W. S. Land and Cattle Company 51,000 acres of land in Colfax county, New Mexico, and immediately began preliminary surveys preparatory to putting in a thoroughly modern and up to date irrigation system. The system when completed will consist of seven large reservoirs, with a capacity of 64,500 acre feet. The water to supply these large reservoirs is drawn from the Cimarron and Vermejo rivers and their tributaries, which drain an area of nearly 1,500,000 acres of mountain land immediately adjoining the tract. The irrigation system is considered by experts to be one of the best and most thoroughly constructed in the west and fully equal to the best work done by the United States government.

The demand for the lands of this company being so great, in July, 1909, they purchased 74,000 acres more adjoining their first holdings, being the balance of the tract owned by the W. S. Land and Cattle Company. Of this latter purchase about 35,000 acres will be irrigated,

els per acre. Large crops of millet have been raised and the value of these first year's crops have in some instances been sufficient to pay for one-half the purchase price of the land.

The second crop to be raised by these farmers in the year 1910 will be sufficient to pay for the entire purchase price of the land. Where alfalfa grows successfully it clearly demonstrates the fertility of the soil. It is nature's guarantee that the soil is good.

The semi-arid country of the southwest is the natural home of alfalfa. Nowhere else does it grow to so good an advantage and become so rich in the singular fattening qualities that has given it so well earned a reputation.

Alfalfa is one of the leading products of this valley. It yields from five to seven tons per acre yearly and the local demand insures a good price. Fifty dollars to sixty dollars per acre is the ordinary value of a year's crop of alfalfa in this locality, and as the country develops this amount will be increased instead of diminished. When the expense of caring for and placing on the market of this crop is considered the net amount received from alfalfa land is perhaps greater than any other crop, excepting fruit.

The sugar beet is another crop that promises much to the farmer. This county has taken numerous prizes on her sugar beets, judged by the percentage of sugar and the purity of the juice. Tests made at the sugar beet factories and by the United States government at Washington show that the beets raised in Colfax county contain several per cent more sugar than those from any other state.

The standard price paid by the factories at the railroad in this county is \$5.00 per ton, which is the same price paid at the factory, the expense of freight being



Views on the French Land and Irrigation Company's Project, New Mexico.

the remainder consisting of rolling land suitable for pasturage and timber land in the mountains covered with an excellent quality of merchantable pine timber.

The soil on this tract is a dark chocolate loam, rich in all the chemicals necessary to produce the best quality of alfalfa, grains, vegetables and fruits.

Colfax county is the best apple country known in the United States. Orchards have produced in abundance for over thirty years without a failure.

The perfect climatic conditions, the large number of sunshiny days to mature the fruit and the absence of insects all assist in bringing it to the highest stage of development. In appearance they have a ripe, rich, red tint and perfect form, that make them a marvel of beauty, and possess a peculiar flavor that cannot be surpassed. Apples from this district took first prize at the Buffalo Exposition.

Owing to these conditions, that do not exist elsewhere in the United States, the apple is the best paying commercial fruit crop, but all kinds of small fruits grow in abundance. Cherries and plums are a safe and profitable crop and the pear and quince yield abundantly.

While this tract of land has only been recently opened for sale, there have been upwards of 6,000 acres broken up and seeded to grain and millet during the season of 1909. The results obtained by new settlers working under all the adverse conditions that must of necessity come to them in settling upon and opening up a new farm, the results obtained have been wonderful. Oats have been grown on these new farms, newly broken up in the spring of 1909, that have yielded from fifty to seventy-five bush-

paid by the factory, owing to the superior quality of the beets. The average yield per acre is from fifteen to thirty tons. It costs about \$30.00 per acre to raise them, and taking the smaller average of fifteen tons per acre, the net profit would be \$45.00.

The local demands from the cities, ranches and mining camps furnish a market for vegetables that is constantly growing and insures a profitable market for this kind of produce for all time to come. New Mexico has never yet been able to produce a sufficient quantity of edibles for her people and has had to depend on neighboring states for her supply.

Celery, tomatoes, rhubarb and asparagus are especially fine, and cantaloupes and water melons cannot be beaten anywhere.

Cabbages and cauliflower grow to an immense size, frequently weighing from twenty to twenty-five pounds each.

As an instance of what the ordinary farmer can do raising vegetables for the market, Mr. E. L. Gorham, formerly of Rockford, Ill., now residing near French, and a recent settler on these lands, raised on one and one-fourth acres newly broken in the spring of 1909, 130 bushels of Mexican beans. The market price at the stores in French, N. M., for this product is now 4 cents per pound. At this price his one and one-fourth acres netted him nearly \$300.00.

This result as well as other estimates made in this article is not unusual, being only what any farmer may do one year with another by careful and intelligent management.

(Continued on page 45.)

Land of Taos—New Mexico

Home of an Ancient Civilization, Antedating the White Race—Rich in Historic Interest—Curious Rites of Present Day Taosans Baffle Inquiry—Irrigation Practised in Remote Age—Ranchos Orchard & Land Company Introduces New Methods—Valley Proves Its Richness by Grain, Stock and Fruit Yields.

—A valley so rich in archaeological interest that it has contributed more facts to the study of the ancient American peoples than any other section of the United States.

—Scenery whose sublimity exalts the mind and inspires mankind with a lowliness and contentment in the contemplation of the mighty works of the creation.

—Climatic conditions that bar disease, promote longevity and give to humans a virility and energy far surpassing that of the dweller in cities or lowlands.

valley had reached the zenith of its glory and had passed to the decline. As the army of white men approached the western mountains it was convulsed by strife and turmoil. When the first fair skinned intruder gazed upon the peaceful valley its peoples had diminished, its structures had decayed, its institutions had faded into the great past from which there was no recall.

Yet there remains today in the valley of the Taos the gaunt and silent sentinels of a by-gone race. The native engineer has left his mark upon the landscape. Here are the homes of his ancestors and his progeny, the pueblos with their impregnable walls reared with methodical exactness. Away in the valley are the fruits of his constructive skill, the canals and ditches by which he carried water to the parched acres. His was a crude yet a wonderful skill, for he knew no precedent and he created an art.

But in this wreck of a nation, this relic of another world, there remains one connecting link between the old and the new. Each year, at a given time, the Taosans gather in secret conclave for mysterious rites and ceremonies into which the Gentile may not so much as inquire, for the secrets of his people are guarded as faithfully by the Indian as are the Masonic rites of today. Old settlers



Pueblo of the Taos Indians. These Structures Have Endured for Hundreds of Years and Are Still Occupied by the Last of a Once Powerful Race.

—Soil, impregnated with plant foods and eager to yield up its bounty at the magic touch of water, from which it has been withheld for hundreds, perhaps thousands of years.

Such is the valley of the Taos. Isolated from modern civilization by almost impassable barriers, it escaped the eye of the prospector and the rancher alike until within the past decade. While the white man was slowly pushing his way westward from the narrow chain of colonies along the Atlantic coast, the Taos valley of New Mexico enjoyed a culture and a civilization unknown to any other section of ancient America.

Long before Jamestown had been founded the Taos

residing in the valley, declare their inability to gather even a farthing of understanding from the stoical Indian. Neither his cupidity nor his friendships will tempt the Taosan to divulge the secrets of his honored customs.

Ethnologists are baffled in their attempts to gain a crumb of information upon which to base an assumption. It is asserted, and there is reason for the belief, that the present descendants of the race know not of the import of their ceremonies and that it is only the superstitious belief in the ancestral custom that prevents abolishment. Whether or not this surmise is correct, it is predicted that the last survivor of the race will carry his secrets to the grave.

From the site of this ancient seat of learning there now springs a new civilization founded upon the pulsating energy of a white race. Already the valley of the Taos has been reclaimed from its dilapidation and decay. New towns and villages are assuming form. The modern implement, the modern method, and, greatest of all, the modern brain are developing this valley into an earthly Elysium. Fields are being reclaimed from long aridity, substantial construction, based upon more modern lines, is supplanting the old canals; thousands instead of hundreds of acres are smiling under their loads of fruit and grains.

To the Ranchos Orchard & Land Company, headed by A. L. Barker, of Hopkinton, Iowa, must be given



Where Kit Carson Made His Home in Taos Valley.

much of the credit for the development of lands in the Taos valley and the rapid growth of the various communities within this district during the past few years. Until this company, whose officials were confident of the success of their project, had invested large sums of money to carry water to fields distant from the Pueblo river, there was a comparatively small part of the valley under cultivation. But since the date of the company's initial operations the growth has been steady and rapid.

Nearly 10,000 acres of land have been reclaimed by the Ranchos Orchard & Land Company, but its operations had been conducted so quietly and with so little effort at publicity that the eastern world knew nothing of its rapid work. Attracted by the rumors of peace and plenty in a valley far removed from railroads, numerous travelers made the journey only to become enamored of the climate, the scenery and the general air of good cheer and contentment, and, finally, to settle upon the fertile acres for a life of serenity and comfort.

But with the influx of the more commercially inclined, the valley has begun a boom which promises to make it the greatest orcharding district in the United States. Scientific methods have been introduced in a manner and on so extensive a scale that a few years must bring an enormous production of tree fruits.

"We need little advertising," said President Barker during a recent visit in Chicago. "Taos lands and products are doing more publicity work for our company than might be gained from a thousand columns of newspaper space. Settlers on the Ranchos Orchard & Land Company's tracts are satisfied, yes, more than satisfied, they are enthusiastic. Their personal letters to their friends or relatives in the east or the middle west have brought a steady stream of buyers into the valley. Nearly every

acre of ground under the company's control has been purchased." When asked as to the progress of construction work, he said:

"Within a few weeks we will be able to place on the market a tract of about 7,500 acres into which we are now completing a ditch about eight miles long. We also contemplate the construction of a ditch from the Ranchos



Group of Citizens of Taos Valley, including Indian.

river to reclaim about 2,500 acres, although this work is now just beginning. There are nearly 300,000 acres of irrigable land in the Taos valley and the company will continue its work until 30,000 families are supplied with homes and the present towns and villages shall grow to thriving cities."



Engineers' Camp on Property of the Ranchos Orchard & Land Co.

Investors in the Taos orchard lands are strong in their praise of this locality. They point to the fact that in some of the parts where irrigation has been practised for many years there is no record of even a partial failure of the fruit crop. The attention of experts in apple growing has been directed to this valley and it is recorded that numerous easterners of means have purchased large tracts upon which to grow apples and peaches for an exclusive eastern demand. These heavy producers have



Presbyterian Church, Rancho, Taos Valley.

sent experts to plant and cultivate the growing orchards and from their methods the less experienced settlers are enabled to gather many valuable facts, and information that shall result in maximum crops.

C. E. Watson, of Chicago, has recently visited the valley on a tour of inspection to the 1,280 acres of orchard planted this year under his direction. He is optimistic as to the future and states that the crops throughout the entire valley are giving most bountiful harvests this year. When it is considered that Mr. Watson is not only an expert in the grading of apples and has backed his long experience by buying Taos lands, but that he is also investing more than a quarter of a million of dollars in his ranch, it must be admitted by the most skeptical that fruit lands in this section give promise of lucrative returns.

For those settlers who find themselves unable to await the products from the orchard, because of limited finances, the market for garden truck, potatoes, small fruits and vegetables gives promise of speedy returns upon investment. Prices for produce are high, due to the demand not only from residents of villages within the valley, but also from those districts surrounding where agriculture is impossible. Peas, potatoes, corn, oats, barley and alfalfa give large yields and the small farmers are enabled to market readily and without heavy expense of transportation. Reports of wheat yields show from fifty to sixty bushels, weighing from fifty to sixty-five pounds, and of a quality that creates a ready market.

Aside from earth products, there are other important industries in the valley. No more favorable conditions can be found for bee culture; poultry raising or dairying. Returns upon money so invested, as shown by actual results, are beyond the most optimistic conceptions of eastern producers. Almost continuous sunshine, a luxuriant growth of grasses and flowers, and both pure air

and water contribute to the success of these industries.

Live stock raising is yet an important industry although the higher returns from ground cultivation has detracted from its former prominence in the valley. Hog cholera is unknown as are many of the other ailments to which stock in eastern communities is liable.

In the direction of new industries and better means of transportation the Taos valley looks with satisfaction at the developments of the past year. The St. Louis, Rocky Mountain & Pacific Railroad has constructed its line to within a few miles of Taos and it is confidently predicted that this work will be completed within a twelfth-month. It is anticipated that through this easier method of entrance large numbers of settlers will be induced to investigate the lands. It is also probable that the Denver & Rio Grande will shortly begin construction of a line through this district.

Local commercial organizations, aided by the Rancho Orchard & Land Company, are rapidly closing negotiations for the various industries required to utilize the sugar beets, grain and live stock without the expense of shipment to distant points. Aided by the demand for manufactured supplies the retail interests in towns and villages are rapidly expanding and increasing in number. The mechanic and artisan finds a ready market for his



Mexican Ranch, Rancho.

services in the construction of business and residence buildings.

Manager Joe B. Warner, who has charge of the Denver office for the Rancho Orchard & Land Company, and who is manager for the company at Taos, has lately returned from a trip of inspection to determine what steps may be taken to hasten the company's construction work and thereby to increase the acreage available for cultivation. In a letter dated at the Denver office, 625 Commonwealth building, he states that all crops in the Taos valley will be above the normal this year and that farmers and citizens alike are enjoying the fruits of great prosperity.

Fountain Valley Land and Irrigation Company

An Attractive Project Near Colorado Springs, Colo.

Lying in a country that is already famed throughout the nation as a health resort, and to which benevolent and fraternal organizations send their stricken and suffering members for rejuvenation and recreation, the Fountain valley district of Colorado promises brimming health to every purchaser of land within its sheltered precincts.

Fertility of the land under irrigation is unquestioned. Proofs have been and are given by reports of fruit and grain crops each year. It is a place where health is a heritage, wealth may be easily accumulated, and enjoyment is but the natural product of right life.

Land immediately tributary to the Fountain river has been cultivated under irrigation for many years; in fact, some of the smaller ditches and water-rights along the Fountain in this vicinity were installed and in operation many years before larger projects, which have recently become so well known, were thought of.



A Colorado Onion Crop.

The soil in this valley is rich, deep, well drained, has a good sub-soil and is free from stones and alkali. Another feature of importance is that there is no heavy brush to clear from it. It is easily plowed and cultivated, and the surface is smooth and can be irrigated with very little effort.

Some years ago the Fountain Valley Land & Irrigation Company was organized to water lands higher up than the main stream level, which would take in extensive reaches of productive land lying on mesas and hillsides at and near the town of Fountain.

Construction work was carried on, reservoirs built, and all of this work has been duly accepted by the state engineer of Colorado, and the engineering features, including water rights and water supply have been certified by one of the leading engineering concerns in the world, Arnold & Co., of Chicago.

Water in abundance is stored in these reservoirs at flood time of the stream, and recent reports from there state that it has been found necessary to cut the water off from the main reservoir, as it was then so full that there was fear of injury being done to the dam. This is mentioned merely to illustrate that there is sufficient water to supply for the total acreage of something like 24,000 acres.

The seasonableness and adaptability to crops and fruits have been certified to by such authorities as Hon. W. S. Coburn, President of the Colorado State Board of Horticulture, who personally visited this land early in 1909.

Products from the Fountain Valley find ready market at high prices throughout the state. It is said that Fountain Valley alfalfa brings nearly double the price to be secured in any

other irrigated district, due to the strong local demand for feed in the mining country adjacent.

Six large railways enter Colorado Springs, and all of the lines between Denver and Pueblo pass through or adjoin the Fountain Valley lands. It is said that there are one hundred passenger trains which run through Fountain, in either direction, every twenty-four hours.

The climatic and scenic features of this particular section are world renowned, being in close proximity, some of the land lying as close as three miles from the limits of Colorado Springs, and the majority of it lying within ten miles of that



An Alfalfa Field near Fountain, Colorado, June 9, 1909.

delightful health resort indicates what may be expected in the way of climate. The air is particularly pure, with reports to show that there are over 300 days of sunshine in each year. It is probable that more people have been benefited by the wholesome atmosphere in and around Colorado Springs than in any similar area in the United States.

The schools and social features are unexcelled. At Colorado Springs, near by, may be found colleges, while the high school at Fountain is one of the best in the west.

When one examines the reservoirs on the Fountain Valley



The two views on the left show Main Supply Canal; view on the right, Water Flowing into Reservoir No. 2, Fountain, Colorado.

lands, stored with water from the great Pikes Peak water shed, he does not question the fact that there is sufficient water to supply all the needs of this tract for all time to come. The quality of the water rights, the sufficiency of the supply, the construction of the system and of engineering features have been favorably passed on by one of the most celebrated engineering concerns in the world, the Arnold Company, as above stated.

President Coburn has gone on record concerning the soil of this section and the location in the following words:

"My closer examination of the soils and location yesterday only confirm my former opinion that these features of the Fountain Valley district are equal to the best in Colorado. The irrigation system seems to be all that is claimed for it. I found the big supply canal from the Fountain river



Home with Apple Trees in Fountain. Full of Fruit June, 1909.

running with water, and the two reservoirs, dams, etc., impress me quite favorably.

"In conclusion, I would say that with proper irrigation and above advice adhered to, all settlers in the Fountain Valley district should do as well as in any part of Colorado. In some respects you combine advantages here which are probably not equalled elsewhere. You are fortunate in being supplied from the Greeley district through Denver on the north or from the Arkansas valley through Pueblo on the



Grammar and High School Building in Fountain, Colorado.

south, or from other more remote points, compelling prices for products greater than any other in the state.

However, Fountain Valley can successfully compete in the markets of Denver and Pueblo, as the latter is only 31 miles south by four lines of railway, and Denver is only 75 in close to the mountains, and in touch with the best markets of Colorado, besides the excellent schools, social advantages, etc. With the splendid quality and good variety of your soils, free from alkali, stones and brush to clear, all you need for the highest success is proper irrigation."

Probably in no one thing is the superiority of Fountain Valley so pronounced as in its markets. Colorado Springs, Manitou, Cripple Creek, Victor, Colorado City (points directly connected) and other important mountain markets to which Colorado Springs is the gateway, such as Leadville, serve altogether a population of about 200,000 people, besides the annual gathering of tourists, which is estimated at 150,000 people.

Aside from Fountain Valley these places must draw their

miles north of Colorado Springs by five lines of railway. For example, alfalfa in the stack usually brings \$10.00 to \$11.00 per ton in Fountain Valley Springs. By delivering at Colorado Springs, within hauling distance, a much larger price is obtained, the figures often running as high as \$16.00 to \$18.00 per ton.

Comparing with prices in other noted irrigated districts of Colorado, it will be found that these figures are about double the average market prices in the best of them.

There is a sugar beet dump at Fountain where beets may be delivered at the same price, \$5.00 per ton, as at any factory in Colorado. Fountain Valley beets have taken first state prizes for both quality and yield per acre.

Poultry and eggs are profitable products in Fountain Valley. The market for them in Colorado Springs is one of the best in the United States.



Gateway to the Garden of the Gods at Colorado Springs and View of Pike's Peak, near Fountain, Colorado.

Cripple Creek, the greatest gold mining camp in the world, is near Colorado Springs, connected by the famous Short Line Railway, the finest scenic route in the world, Switzerland not excepted.

Secretary Craig, of the Colorado State Commercial Association, has prepared figures showing average yield and prices of fruit and crops in Colorado. It shows that the average gross yield of cherries is 1,500 per acre, plums \$750 per acre, apples \$500 per acre and peaches \$425 per acre.

President Coburn of the State Board of Horticulture strongly recommends navy beans as a profitable field crop for



Cathedral Spires in the Garden of the Gods at Colorado Springs.

Fountain Valley. He considers that farmers should make from \$75.00 to \$100.00 per acre. They can be cultivated as easily as corn and will yield three or four times as much. They will yield as much as sugar beets and one man can cultivate two or three times as much.

Domestic water is usually found in Fountain Valley from 40 to 80 feet deep. It is soft and of excellent quality and wells are easy to bore.

Good domestic coal is mined near Fountain within easy hauling distance. Price at mine never exceeds \$2.00 per ton.

season. We already have a man on the grounds laying plans for the erection of a substantial cement farm house and barns, with covering for machinery, etc. A well will be sunk soon for domestic purposes. It is our intention to publish from time to time a report of the development of our work on this



Young Cherry Orchard in Fountain, Colorado. Full of Fruit, June, 1909.



Alfalfa Field near Fountain, Colorado. Water Ditch in Foreground.



A Yard of Colorado Potatoes.



Homes in Fountain, Colorado. Fruit Trees Loaded with Fruit June 1909.



Apple Orchard in Fountain, Colorado. Full of Young Fruit June, 1909.

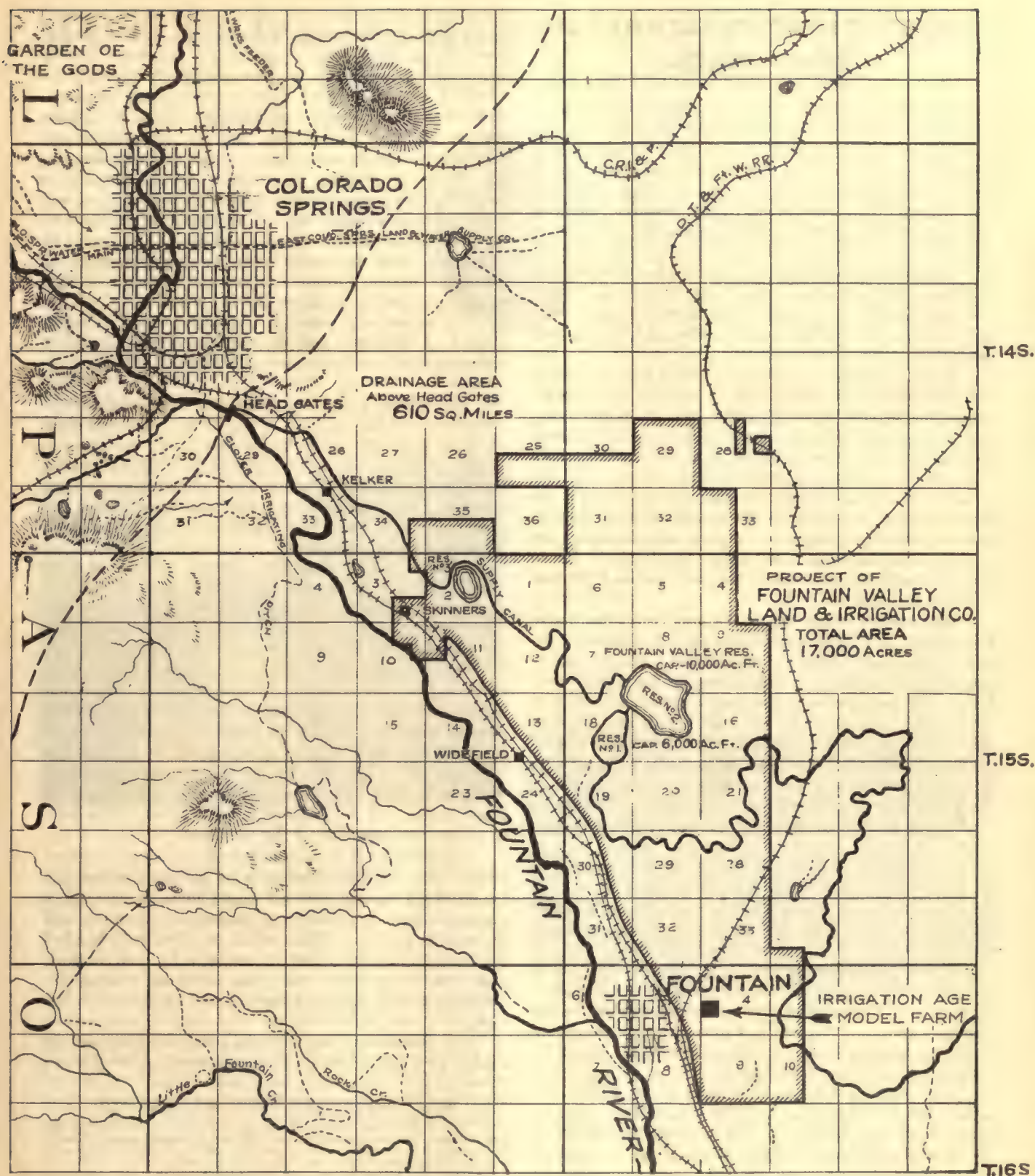


Shaded Road in Fountain, Colorado, June, 1909.

Local prices of lumber and all materials and other merchandise at Fountain and Colorado Springs compare favorably with prices in the central states.

The editor of THE IRRIGATION AGE has recently purchased a tract of land near Fountain, which may be seen on the map shown in these pages, and is preparing to crop it next

ranch, which we trust will be interesting to our readers. Additional information, with illustrated literature concerning this section, may be obtained by addressing W. C. Johnston, President Fountain Valley Land and Irrigation Company, Colorado Springs, Colo., or The Pearsons Wilhite Company, 181 La Salle street, Chicago.



FOUNTAIN VALLEY LAND AND IRRIGATION COMPANY.

The illustration above shows the location of the Fountain Valley Land and Irrigation Company's project near Colorado Springs, Colorado. The Editor of IRRIGATION AGE has purchased fifty acres under this system and will improve it as rapidly as possible. It is his intention to erect a comfortable cement house and barn this season. The entire fifty acres has been broken, leveled and sowed to oats this year. All work and improvements on this ranch will be illustrated and described in these columns from time to time. Many eastern and central states people have purchased land under this system. The climate of this section is equal to that of any in the world. For additional information address Fountain Valley Land & Irrigation Co., Colorado Springs, or Pearsons & Wilhite Co., 181 La Salle St., Chicago, Ill.

Scientific Horticulture at Lewiston Idaho

The earlier orchards that were planted in the north-western country were handled on the principle that man would plant and God would do the rest. Every grower tried to get as many trees on an acre of ground as he could and he tried also to get a crop as early as possible and pruning was conspicuous by its absence. Spraying was early known to be essential, but due to faulty planting and faulty pruning it was not effective. The advance in years and knowledge changed all this, but changed it in individuals and not as a whole. The great fruit districts contained hundreds of owners who have developed horticulture to a science, but hundreds also who handle their properties in the bygone ways.

Every district contains the anomaly of first-class property immediately in contact with an orchard which would shame the grower of thirty years ago. It is not infrequently known that orchards have been sold at prices varying from \$1,500 to \$3,500 an acre, when the orchard alongside has failed to market at \$500 an acre, the trees being of equal age and the varieties the same. The difference is due, of course, to the amount of profit derived from one and from the other, and the sole reason of the one being profitable and the other unprofitable is due to the good horticultural care on the one hand and the lack of it on the other.

That district which lies at the junction of the Snake and Clearwater rivers, immediately in the suburbs of the city of Lewiston, Idaho, has inaugurated a system of horticultural care which is a radical step in the evolutionary process of fruit growing, and this district, unsatisfied to have only a percentage of first-class properties, has conceived it to be possible to make of every orchard a technically perfect property. They have engaged the services of a man who was recently professor of horticulture at the University of California and have given into his hands the domination of the district from a horticultural standpoint.

Those who purchase are compelled to sign a contract by which they agree that their property will be cultivated and cared for in a horticultural like and thrifty manner, thus delegating into the hands of a horticultural expert the superintendence of their properties.

It will not be uninteresting to indicate briefly who was chosen, after persistent examination of the capability of many, for the position of horticultural adviser in the Lewiston country. To that end follows a quotation from a bulletin which is one of a series continuously issued by the Lewiston Orchards Company.

"The company has employed Prof. E. H. Twight, recently from the University of California, to direct its horticultural work at Lewiston. His time will be devoted to the general supervision of the planting and care of all fruit properties in Lewiston orchards, and to experimental work and lecturing, with a view to developing the orchard system of the valley in the most perfect manner, to the end that all orchards within the company's district may receive expert care. Prof. Twight will personally inspect each orchard from time to time and render a report, together with his recommendations, to the owner.

"Prof. Twight took the B. S. degree at the National

University of France at Montpellier, after which he spent three years in the College of Agriculture at that institution, taking the degree of agricultural engineer. During his technical course he traveled extensively through the vineyard districts of France, Italy, Switzerland, Germany, Spain and Algeria. After graduating he came to Canada for the Canadian government, and for two years examined lands and locations, after which he was sent by the British government to Australia for the purpose of experting vineyards. On returning to this country a year later he was employed by the California Wine Association in the capacity of chemist and consulting expert in viticulture, and was then called by the University of California to the position of assistant professor of horticulture, where he remained for five years.

"In writing the company concerning Prof. Twight, Prof. E. J. Wickson, dean and director of the College of Agriculture at the University of California, states as follows:

"Mr. E. H. Twight is a thoroughly trained man in the viticulture of Europe and of California, understanding the grape from the choice of the land to the manufacture of the products. He is also trained in collateral studies and is what the French would call a qualified agricultural engineer. His work with us was very satisfactory, and I should consider him well qualified for the undertaking which you have in hand."

"The company is able to get the services of Prof. Twight because he desires to associate himself with the practical development of commercial orchards and believes that the Lewiston field offers superior advantages for successful orcharding and vine culture."

Prof. Twight has instituted an organization of inspection from the selection of nursery stock to the completed orchard. So complete in details has his system become that an owner of an orchard property living in the east can receive from him reports as to just the condition of the property at any time during the season. Periodically, whether requested or not, the owners of property are sent a statement as to what work has been done and the condition of the property.

The result of Prof. Twight's work has already demonstrated itself to the satisfaction of everyone concerned. In all the Lewiston orchard tracts there is scarcely a property from a horticultural standpoint which is not technically perfect. Those which are less well handled are those which are cared for entirely by their owners, and even these, under the advice of Prof. Twight, are better properties than the average of any district in the west.

The Dahlhjem Company of Lewiston, Idaho, will be glad to give further information to anyone who will write them.

NORTHWESTERN IRON HEADGATES.

The old fashioned wooden headgate will soon be a thing of the past in up-to-date irrigation districts. Water is becoming too valuable to be trusted to leaking, warping, swelling wooden headgates that wash out when the farmer needs the water for his crops.

When an irrigation system is equipped with iron headgates that are absolutely water tight, the water they save more than pays for them, and the farmer under the system does not have to worry about his water when he wants it.

C. D. Butchart, 501 Mercantile building, Denver, Colo., specialist in headgates and inventor and manufacturer of Northwestern iron headgates, has perfected iron gates which can be adapted to any size reservoir, ditch or lateral, and they are being used in the best irrigation systems in the country.

Irrigation engineers, irrigators and those interested in the building of irrigation systems should write to him at once for a copy of his latest illustrated catalogue, giving full particulars about Northwestern Iron Headgates.

Government Reclamation Service to Date

Edmund T. Perkins, Engineer in Charge, Chicago Office

The National Reclamation Act, and the work of the Reclamation Service under it, have become familiar topics to most of the readers of the IRRIGATION AGE through the large amount of publicity which has been given through its columns to this work of the Government within the past few years. It is believed, however, that a statement at this time of the progress made on the various projects and the work of the recently-established Settlement Bureau in Chicago will be of sufficient interest to justify its publication. On June 17, 1902, the Reclamation Act was made a law by the signature of President Roosevelt. The substance of this act was that all moneys received from the



E. T. Perkins.

and using the funds which are made available by it, the Reclamation Service has expended nearly fifty million dollars in the building of irrigation works in thirty localities in the west. Some of the projects, viz.: the Garden City in Kansas, the Carlsbad, Hondo, and Leasburg in New Mexico, and the Huntley in Montana, have been completed and are in successful operation. Others, such as the Minnidoka in Idaho, the Truckee-Carson in Nevada, the North Platte in Nebraska, the Umatilla in Oregon, the Okonagon in Washington, and the Fort Shaw unit of the Sun River in

Montana, are nearly finished, and water is being delivered to a portion of the irrigable lands. On the Salt River project in Arizona, the Yuma project in Arizona-California, the Shoshone project in Wyoming, and investigation, and the construction of the necessary dams, canals, etc., will be begun immediately upon the completion of the larger projects, the construction of which have to date consumed most of the funds. The work is being planned in such a way that no time will be lost, and all parts of the country will share in the prosperity which invariably follows the construction of a Government irrigation project.



Main Canal, Mesa Project, Arizona.

sale and disposal of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming, beginning with the fiscal year ending June 30, 1901, including the surplus of fees and commissions in excess of allowances to registers and receivers, and excepting five per centum of these amounts which is set aside for educational and other purposes, be set aside and appropriated as a special fund in the treasury to be known as the "reclamation fund," to be used in the examination and survey for and the construction and maintenance of irrigation works for the storage, diversion, and development of waters for the reclamation of arid and semi-arid lands in the said states and territories.

The public lands so reclaimed are subject to homestead entry, and there is absolutely no charge for the land itself, though the settler must pay to the United States, in not more than ten annual installments—without interest—his proportion, according to the number of acres he owns, of the amount expended by the United States in reclaiming his land.

Acting under the authority of the Reclamation Act



Onion Patch, Fallon, Nevada. Note the Irrigation Furrows Between the Rows.

The statistician of the Reclamation Service, Mr. C. J. Blanchard, estimates that more than fifteen million dollars have already been added to the wealth of the west through the crops raised on reclamation projects. This does not take into account the enormous addition to land values which is the direct result of the reclamation work.

The year 1909 is really the first in which notable returns have been made. It is now seven years since the Reclamation Act was passed. During this interval surveys and examinations have been carried on throughout the western half of the United States. Large projects have been laid out and the most important structures have been built to a point where 768,000 acres have been supplied with water, or brought to a condition where settlers,

by proper application to the land office, can immediately take the water to their fields.

The work is not in advance of the needs of the people but is in advance of their knowledge of its possibilities, for out of this 768,000 acres applications for water rights have been received for only 425,000 acres, leaving 343,000 with water ready for the plow. The great problem, therefore, is no longer that of engineering, but how to put this land into the hands of the men who will immediately utilize it for crop production. The approximate investment in this 343,000 acres, which is now standing idle, is a little over ten millions of dollars, so that in one sense these ten millions of dollars are locked up until the farmer makes application for the water and returns to the Government his proportionate share of the money which has been invested in this reclamation work.

predicts that with the excellent harvests secured from the irrigated lands this year, it will not be many months before the areas unutilized will be taken up and put in crops. The opportunities for homemakers on a number of these projects are so attractive, and the terms under which these lands are disposed of so reasonable, that there is every reason to expect a heavy rush of homeseekers to take up these farms before the beginning of the next crop season.

In the office of the Reclamation Service in Chicago, a systematic campaign is being carried on to disseminate information about the opportunities for making homes on these reclaimed lands. Room 802 in the Federal building (postoffice) has been fitted up as an exhibit and lecture room and is visited daily by hundreds of people who desire to secure information about the Government's irri-



Field of Wheat on Glein Ranch, Klamath Falls, Oregon.

A considerable portion of this vacant irrigable land is embraced in four projects now completed in Montana, Wyoming, and Nevada. On other projects the farmers, owing to lack of funds, scarcity of labor, and other conditions, have not been able to prepare all of their land for water, and thousands of acres were for this reason unproductive this season.

The Chief Engineer of the Reclamation Service, now in the field, calls attention to these important matters, but

gated lands. Around the walls are arranged beautifully colored transparencies which show the principal engineering features of the projects and scenes on irrigated lands. The exhibits consist of fruits, vegetables, and other farm products. At stated times illustrated lectures are given by the settlement agent, Mr. J. C. Waite, on the work of the service, with particular reference to the phases which are of particular interest to prospective settlers. In addition,

(Continued on page 58.)

Revives Old Project; Success Is Assured

Frank P. Read of Denver, One of the Nation's Stalwarts in the Reclamation of Arid Western Lands.

When the history of American reclamation work is written and those sturdy pioneers who are today devoting their brains and energies to vast irrigation projects shall have been given proper credit for achievement, the name of Frank P. Read of Denver must occupy a place on the roll of honor.

While he is a comparatively young man and, obviously, has not yet reached the summit of his ambitions, his name is familiar to many of the peoples of the west. It may be said that he is upon the threshold of a career that promises fame and fortune to himself and development for those districts into which he may direct his tireless energy and his potential power of organization and execution.



View of Main Canal, Nearly Completed.

Coupled with his capabilities in the practical work of building is a keen insight into financial affairs and a knowledge of both electrical and civil engineering. In



Showing Volume of Water Available on Model Land and Irrigation Company's Project, Colorado.

this respect he possesses advantages over many promoters who lack one or more of these qualifications.

At the present time Mr. Read is bending his energies toward the completion of a project in the vicinity of Trin-

idad, Colo., known under the name of the Model Land and Irrigation company. The story of his revivification of this project at a time when it lay nearly dormant and promised no immediate results, forms a base upon which to judge of his abilities.

In December, 1908, Mr. Read, who had established a reputation as president and manager of the Trinidad Electric Light, Power and Gas company, first directed his



Mr. Frank P. Read.

attention to an irrigation project for reclaiming lands in the Las Animas country. A stock company had been formed and partial surveys for an extensive system had been completed. Yet there was lacking a dominating spirit to prosecute the work and bring the project to completion. Dilatory efforts at construction work had served but to discourage settlers and stockholders as well.

With characteristic energy Mr. Read called a meeting of stockholders and laid before them a proposition to finance the company and take full control of the proposed work. His offer was accepted and his first step was to secure the co-operation of the capital necessary to instant resumption of work.

As originally outlined, plans call for the construction of a reservoir about four miles above Hoehue. The big basin is to be filled from flood waters of the Purgatoire and Chicosa creeks. A flood dam of masonry will be

thrown across the river near El Moro and the water will be conducted along a ditch to the reservoir. Along a part of the route the natural arroyo will be used to carry the water. The outlet ditch will be twelve or fourteen miles long and will run in a general southeasterly direction to a point near Earl, where it will go under the Santa Fe tracks. Here the laterals will be run over the land.

It is estimated that about 20,000 acres will be brought under water when these works are finished. The undertaking is capitalized at \$300,000.

Lands to be reclaimed by this system are among the



Constructing a Ditch, Showing Steam Shovel in Operation.

most fertile in southern Colorado. Climatic conditions make it possible to raise nearly any crop desired, and in neighboring districts, where water has already been supplied, harvests of grains, produce and fruits are sufficient to warrant the most optimistic of predictions for the future of the Model Land and Irrigation company's holdings.

Stockholders, interested in this project, accord the highest praise to Mr. Read for his organization of the work and its rapid advancement since he has been in control. It is stated that his capacity for overcoming obstacles and steadily pushing the work on this project has brought to him the confidence of capitalists in the entire Trinidad district as well as at Denver, where he is well known.

With the end of this work almost in view Mr. Read is now turning his attention to other reclamation projects in southern Colorado. Despite the time required for active work on the Las Animas project he has found opportunity to interest himself in other plans and it can be predicted that the west, as well as the east, will hear of more of his works in the future.

Supreme Court Decisions

Irrigation Cases

FISH.—

Water may not be appropriated to fill a series of small reservoirs or lakes in which to propagate fish.—*Windsor Reservoir & Canal Company v. Lake Supply Ditch Company*. Supreme Court of Colorado. 98 Pacific 729.

TO GAIN PRESCRIPTIVE RIGHT.—

To gain a prescriptive right to water, the enjoyment of the right must be that of a proprietor, and it must also be adverse.—*Rhoades v. Barnes*. Supreme Court of Washington. 102 Pacific 884.

RIPARIAN RIGHTS.—

The common-law doctrine of riparian rights that the riparian proprietor is entitled to a continuous flow of the stream does not obtain in Colorado.—*Sternberger v. Seaton Mountain Electric Light, Heat & Power Company*. Supreme Court of Colorado. 102 Pacific 168.

ADVERSE USER OF WATER.—

In order to constitute an ownership of a right to use water by adverse user, the use must have been open, notorious, continuous, adverse, and exclusive under a claim of right, for the statutory period, which is 10 years. *Smith v. Duff*. Supreme Court of Montana. 102 Pacific 981.

CONTINUOUS ADVERSE USE.—

An adverse use of an irrigation ditch during the cropping season only constitutes a "continuous adverse user," as its nonuser when the water is not needed does not interfere with the continuity of use.—*Silva v. Hawn*. Court of Appeal, Third District, California. 102 Pacific 952.

CONTEST OF WATER PERMIT.—

The act of March 11, 1909 (Laws 1909, p. 300), which provides for a contest of a permit issued, and vesting power in the state engineer to cancel such permit, does not vest in the state engineer judicial power.—*Speer v. Stephenson*, State Engineer. Supreme Court of Idaho. 102 Pacific 365.

DISTURBANCE OF PRESCRIPTIVE RIGHT.—

Conceding that a diversion of water from a dam initiated a prescriptive right thereto, it is disturbed by obtaining permission to lay pipes across land in question, and take from the dam at a point 300 feet from the first diversion.—*Rhoades v. Barnes*. Supreme Court of Washington. 102 Pacific 884.

EXCHANGE OF WATER.—

Where a system of exchanges of water between different owners of reservoirs, if put in practice, would necessarily convert a junior water right into a senior priority, it could not be sustained.—*Windsor Reservoir & Canal Company v. Lake Supply Ditch Company*. Supreme Court of Colorado. 98 Pacific 729.

WHAT ARE WATERCOURSES.—

Where a stream flows in a continuous current, the fact that the water thereof, on account of the level character of the lands, spreads over a large area, without apparent banks, does not affect its character as a water course.—*Miller & Lux v. Madera Canal & Irrigation Company*. Supreme Court of California. 99 Pacific 502.

ADVERSE USER.—

Proof of the mere use of water during the statutory period is not sufficient; it is necessary that during the entire period an action could have been maintained against the party claiming the water by adverse user by the party against whom the claim is made.—*Smith v. Duff*. Supreme Court of Montana. 102 Pacific 981.

PRESCRIPTION.—

In order to claim the use of an irrigation ditch across defendant's land by adverse user, plaintiff's use thereof must have been continuous and uninterrupted for five years prior to the commencement of his action to enjoin the obstruction of his user.—*Silva v. Hawn*. Court of Appeal, Third District, California. 102 Pacific 952.

DIVERSION OF PERCOLATING WATERS.—

One having a right to take a definite quantity of water from a basin of permeable material saturated therewith, and not composing part of any stream, may change his place of diversion, so long as the total amount of water taken is not thereby increased.—*Barton v. Riverside Water Company*. Supreme Court of California. 101 Pacific 790.

ESTOPPEL TO RETURN TO NATURAL CHANNEL.—

The proprietor of a stream who diverts it into an artificial channel, and continues such change for a time exceeding the statute of limitations, is estopped, as against a person making a beneficial use of the water, to return it to its natural channel to the latter's injury.—*Hollett v. Davis*. Supreme Court of Washington. 103 Pacific 423.

SEEPAGE FROM IRRIGATION DITCH.—

The injuries to land from water seeping from a properly constructed irrigation ditch which is intended to be permanent constitutes a single cause of action, and as affected by the statutes of limitations accrues at the beginning of the injury.—*Middelkamp v. Bessemer Irrigating Ditch Co.* Supreme Court of Colorado. 103 Pacific 280.

CONTEST OF WATER PERMIT—NOTICE.—

Notice of contest sent by registered mail to the last known post office address of the persons or corporation to whom a water permit has been issued of the time of hearing such contest before the state engineer is sufficient notice and due process.—*Speer v. Stephenson*, State Engineer. Supreme Court of Idaho. 102 Pacific 365.

WATERS SUBSEQUENTLY BROUGHT ONTO WATERSHED.—

Where, after plaintiff appropriated waters from a stream, defendants brought onto their lands in the watershed of such stream waters from another watershed, such appropriation did not prevent defendants impounding the overflow or waste of such waters after use on their lands, and using it on other land.—*Miller v. Wheeler*. Supreme Court of Washington. 103 Pacific 641.

DUTY OF WATER.—

The amount of water that a water user and consumer has been in the habit of using and applying to his lands cannot be accepted as the true test of the duty of water, but the question to be determined in such case is the amount actually necessary for the useful or beneficial purpose to which the water is to be applied.—*Farmers' Co-operative Ditch Company v. Riverside Irrigation District, Ltd.* Supreme Court of Idaho. 102 Pacific 481.

RIPARIAN RIGHTS.—

A riparian owner having a right to take water for irrigation from a stream may do so from any convenient point on the stream, whether at a point on his own land or the land of another, so long as the taking does not injuriously affect the rights of riparian owners between the point of diversion and the land to be irrigated.—*Turner v. James Canal Company*. Supreme Court of California. 99 Pacific 520.

SPRINGS.—

1. Ballinger's Ann. Codes & St., Sec. 4114 (Pierce's Code, Sec. 5829), providing that the person on whose lands seepage or spring water first arises shall have a prior right to such waters if capable of being used on his lands, does not apply to springs which form the fountain heads of a living water course; the waters of which stream having been previously appropriated by another.—*Miller v. Wheeler*. Supreme Court of Washington. 103 Pacific 641.

IRRIGATION DISTRICTS.—

The statute of this state authorizes the board of county commissioners to include within the boundaries of an irrigation district all lands, which in their natural state would be benefited by irrigation, and are susceptible of irrigation by one system; and this is true regardless of the question as to what particular use is being made of any particular tract or piece of land at the time the district is organized.—*Oregon Short Line Railroad Company v. Pioneer Irrigation District*. Supreme Court of Idaho. 102 Pacific 904.

ASSESSMENT OF RAILROAD RIGHT OF WAY.—

The fact that the officials of an irrigation district neglect to assess the right of way and station grounds of a railroad company for certain years is not a reason why such right of way and station grounds are not subject to assessment by said district; and the company cannot defeat a future assessment by reason of the fact that its property was not assessed for any particular year or years prior to the assessment made.—*Oregon Short Line R. Co. v. Pioneer Irrigation District*. Supreme Court of Idaho. 102 Pacific 904.

RIGHTS TO WATER.—

Where, in a suit to enjoin defendant from interfering with the flow of water in plaintiff's ditch, defendant by answer made no claim to any water nor title to any land, and plaintiffs claimed no definite quantity of water, and did not prove the amount to which they were entitled, a decree attempting to establish plaintiff's title to a definite amount of water, and to settle the rights of the parties as to the water flowing in the main ditch, was erroneous.—*Simpson v. Harrah*. Supreme Court of Oregon. 103 Pacific 58.

EVIDENCE OF DUTY OF WATER.—

The duty of water for the successful irrigation of lands cannot be established by guesswork and hearsay evidence or by witnesses who have never measured water applied to lands and have never seen water measured, and have made no tests in reference thereto, and do not know the size of a stream and the grade or pressure necessary to carry a given number of inches of water as measured under the irrigation law.—*Farmers' Co-operative Ditch Company v. Riverside Irrigation District, Ltd.* Supreme Court of Idaho. 102 Pacific 481.

ENFORCEMENT OF RIGHTS OF STOCKHOLDERS.

Mandamus lies to compel a corporation, organized to secure a supply of water for irrigation purposes and distribute the same among its stockholders for use on lands owned by them, to deliver water to a member for use on his land for irrigation, for he has no adequate remedy at law, and his rights to have water furnished on his land is an inseparable adjunct to his membership, and a plain duty rests on the corporation to furnish the water.—*Miller v. Imperial Water Co., No. 8*. Supreme Court of California. 103 Pacific 227.

WASTE WATER.—

Where water is claimed as the "waste" waters from the farm of an adjacent water user, all the water in excess of that caused by and resulting from seepage is but the quantity diverted by such near-by appropriator in excess of his needs, and accordingly in excess of the quantity to which he may be entitled, and the person receiving and applying the excess to a beneficial use acquires a vested right therein, as would an appropriator of any other surplus water, the inception of which right, like that of any other appropriator, dates from the first steps taken to provide for its use.—*Hough v. Porter*. Supreme Court of Oregon. 98 Pacific 1083.

ACQUIESCENCE IN PRESCRIPTION RIGHT.—

In order to establish a right to use an irrigation ditch by prescription, the right must have been asserted with the knowledge and acquiescence of the landowner, but "acquiescence," which commonly means an affirmative permission or consent, in addition to knowledge of the hostile claim, need not be shown independently of knowledge; and, if the owner has knowledge thereof which the law imputed to him, and takes no steps to prevent the adverse claimant from his continuous enjoyment of the right, he is deemed to have acquiesced in such use.—*Silva v. Hawn*. Court of Appeal, Third District, California. 102 Pacific 952.

ROUTT COUNTY, COLORADO.

Rich in Mineral and Agricultural Products—Makes Exhibit at Exposition.

Experts from Grand valley, Colorado, and from other sections where fruit raising is conducted as a business, have predicted for many years that the Little Snake River valley, in Routt county, Colorado, would be a fruit country, but until this year no results have been obtained in a definite way to bear out these predictions.

The fruit which has been grown this year in parts of the valley demonstrates beyond any question that the Little Snake River valley will produce fruits of every kind in great abundance, and very fine in quality and size. No attempt has been made so far to grow peaches, but apples, pears and plums, as well as small fruits, are all doing well.

Routt county is the extreme northwest county of Colorado. It covers about 7,000 square miles, and it has

up, and with the advent of the Moffat road and the other lines which are now projected for that county, farm lands in all sections of the county will undoubtedly greatly enhance in value.

There are several large irrigation projects now under way in the county. One of the largest of these, a monster irrigation development work which will do for northwestern Colorado what the Twin Falls irrigation project has done for Idaho, is now in progress in the Little Snake River valley, in Routt county, Colorado, where 50,000 acres of land on either side of the river are being reclaimed by the Routt County Development Company, with headquarters in Denver, Colo., under the Carey Land Act.

The land and perpetual water rights are sold to settlers for \$35 an acre, one-tenth cash and ten years for the balance. The price is fixed by the Carey Land Act and the State Board of Land Commissioners. The canal system is being constructed under the general supervision of the state engineer of Colorado.

The Little Snake River valley is reached now from the Union Pacific Railroad from Wamsutter, Wyo. The



An Oat Field Irrigated by the Canal of the Routt County Development Company. Oats in This Field Threshed Ninety Bushels to the Acre.

been correctly stated that the county contains every natural resource necessary to sustain a community without any outside aid. Much has been said and written about the coal fields of Routt county. These are indeed very extensive. There is a world of wealth hidden beneath the surface of this rich section of the country, including gold, silver, lead, copper and iron, as well as coal. The coal fields cover more than 1,000 square miles and are said to contain more coal than the entire state of Pennsylvania. The coal veins vary in thickness from three to twelve feet.

It is not, however, in the mineral possibilities of this section that its greatest wealth lies. Routt county is destined to be the greatest agricultural county of Colorado, and with the development of other industries which go hand in hand with agriculture, it will, in the next ten years, be the greatest wealth producing section of the West. Its soil is suitable for the growing of all kinds of grains, grasses, alfalfa, vegetables and root crops, including sugar beets, small fruits and tree fruits of every description, except possibly the most delicate.

Many people have formed their impression of Routt county from a short visit to the eastern section of the county, and while the agricultural possibilities there are very great, the climate in other sections of the county is probably less severe and perhaps equally if not better adapted for general farming.

The lands around Steamboat Springs, Hayden, Craig and Maybell are now selling at from \$35 to \$45 per acre

upper end of the tract is about forty-five miles from Wamsutter. The land can be reached over the "Moffat Road" from Steamboat Springs and Craig. It can be reached over the Rio Grande by stage or wagon route from Rifle, Colo., via Meeker and Craig, or from Wolcott, via Steamboat Springs and Craig. The larger part of the tract is from fifteen to twenty-five miles from the established line of the Denver, Northwestern & Pacific Railroad (Moffat Road), which is surveyed through Lay and Maybell, just south of the lands under the Little Snake River canal. The survey for the branch of the Union Pacific Railroad from Wamsutter, Wyo., to Craig, Colo., also runs within a few miles of all the land. It has been positively announced that the Union Pacific extension into the valley will be completed next year. The Moffat Road is completed to Steamboat Springs and will be pushed on to Utah next year.

Further particulars concerning the land which can be taken up under the Carey Act in this valley can be secured from the Routt County Colonization Company, 1734 Welton street, Denver, Colo.

This company will have a display at the United States Land and Irrigation Exposition at the Coliseum, Chicago, November 20 to December 4, occupying spaces Nos. 1, 2 and 6, Division L. Mr. C. E. Wantland or Mr. Warren R. Given, representing this company, will be at the Auditorium Annex during the show. The company also has a Chicago office at 910 Marquette building and at 946, 115 Adams street.

Reclamation Notes

CALIFORNIA

By a large majority, owners of 60,000 acres in the Stanislaus and San Joaquin counties voted on October 23 to form an irrigation district.

The California Irrigated Land Company has recently purchased an additional tract near Biggs, and proposes to put this land under water.

The Madera Canal & Irrigation Company is defendant in a suit brought by the City of Madera to compel the company to pay \$500 expended by the city in constructing a concrete bridge across the canal.

Farmers near Wheatland, Yuba County, are becoming interested in pumping for irrigation purposes. Experiments have proved satisfactory and many wells will be sunk within the next twelve months.

Acting as the representative of the Sacramento Valley Irrigation Company, L. D. Waddell has bought the entire holdings and interest in the pumping station on the west bank of the Sacramento River in North Glenn County, from the Sacramento Valley Land Company.

Stockholders in the Santa Ana Valley Irrigation Company are divided over the recommendation of the present board to buy the Bixby holdings in the Santa Ana River. The opponents consider this proposition unadvisable and declare for a policy of retrenchment in finances.

The Santa Ana Valley Irrigation Company and the Anaheim Union Water Company, both cooperative concerns in Orange County, have reached an agreement with the Riverside Water Company, whereby the latter may use 3,300 inches of water. This arrangement ends long litigation.

The Rio Colorado Land & Irrigation Company, composed of Pasadena and Chicago capitalists, is preparing to construct a dyke twenty miles in length on the Arizona side of the river, opposite Needles, to irrigate a tract of 40,000 acres. D. M. Martin, of Pasadena, is manager for the company.

At a convention of land owners in the district lying in the eastern section of Stanislaus County, the following officers were nominated for the ensuing year: Treasurer, M. J. Nightingale and E. N. Moulton; assessor, M. P. Kearney and L. J. Dittmore; tax collector, Carl Wolfer and D. C. Lee.

H. A. Barre, of New York, and F. N. Flynn, an engineer of Globe, Ariz., have formed a company to irrigate land in Box Canyon in the Gila River basin, fourteen miles below San Carlos. Wm. Sparks, of Globe, owns the water rights. It is reported that the cost of the project may reach \$3,000,000.

The report of Edwin Duryea, of San Francisco, as submitted to the board of directors of the South San Joaquin irrigation district at Manteca, estimates the cost of the system at \$1,861,500. The source of supply is in the Stanislaus River. A special election will be held early in December to consider the financing of this project.

In its first application for the formation of an irrigation district in Shasta Valley, lying west and north of the Shasta River, L. J. Hibbring met opposition from the Edson-Foulke Company. The petitioners for the district have filed on 6,000 inches of the waters of Shasta River; 4,000 inches of Parks Creek, and 2,000 inches of Willow Creek.

The Chamber of Commerce at Lincoln, Placer County, is considering the advisability of forming a company to irrigate by deep well pumping. It is said that investigations have disclosed the fact that the project is feasible. Lands have suffered for lack of rainfall and farmers show great interest. Several thousand acres adjacent to Lincoln may be irrigated under this plan.

C. W. Wooster Company, of San Francisco, has purchased bonds on the Chowchill ranch, fourteen miles south of Merced, to the amount of \$1,000,000. The Wooster company proposes to construct an extensive irrigation system to reclaim the 108,000 acres composing this ranch. Many of the stockholders live in Scotland. E. L. Blythe, of Edinburgh, arranged the bond negotiations.

A. G. Wishon, of the San Joaquin Light & Power Company, is working on plans for a pumping plant run by elec-

tricity, to place water on the east side foot hill country, east of Fresno. Since the completion of the company's Crane Valley power plant this project appears more feasible, and it is understood that Manager Wishon will take immediate steps to secure surveys and give attention to the details of the pumping plant.

The government has awarded contracts for the earthwork on the distribution system for the Orland project, California, as follows: Sections 1, 2, 4, 6, 7, 8 and 9 to Anson B. Munson, Stockton, Cal., \$26,780; Section 3. William P. Gay and S. D. Koons, of Orland, Cal., \$3,109.50; Section 5, George T. Hale, W. N. Downer and J. D. Smith, Orland, Cal., \$2,979.50. The distribution system involves the excavation of approximately 200,000 cubic yards. The prices bid range from 11¼ cents to 14 cents per cubic yard.

J. B. Lippincott, assistant chief engineer of the Los Angeles Aqueduct Bureau, denies that he is authority for the statement that the Aqueduct Bureau will irrigate 75,000 acres in the San Fernando Valley. He asserts that there is sufficient water under control of the aqueduct commission for this purpose. It is estimated that the cost of a system to supply this water would approximate \$800,000 and there is now a probability that local land owners will subscribe to this amount in order that the project may be carried forward under private ownership.

The Alessandro irrigation district has been made defendant in a suit by Henry Allan, as intervener in an action commenced against the district by E. W. Freeman three months ago, to recover \$123,400. Directors of the district, at the time it was dissolved by order of court, are also named as defendants. Allan is represented to have bought bonds in 1892 and 1893 and upon these grounds asks the court to set aside the decree of confirmation for the dissolution of the district; that properties be sold and that D. E. Myers be compelled to transfer to the district the property turned over to him as trustee. The original suit was instituted in 1908, but has never been tried.

COLORADO

A government land drawing, in connection with the Two Buttes project, is scheduled for November 22.

Farmers in the Holbrook Irrigation District recently voted by a large majority to authorize a bond issue of \$650,000. Six different items are involved in this issue.

At a meeting of the North Sterling irrigation district, resolutions were passed authorizing the sale of \$55,000 worth of bonds.

J. C. Hedgecock and Edward Lee, of Fowler, have recently filed plans for reservoirs and ditches to irrigate about 4,000 acres in the Blue Ridge Valley.

The Warner-Kinney Syndicate, of Denver, has made application to the State Land Board for 15,000 acres in Costilla County. It is proposed to construct an irrigation system.

Local bankers are said to be backing a project to irrigate 2,500 acres in Park Center, and North Park, near Canon City. It is proposed to carry the water along lower Four Mile Creek.

George Smith, of Grand Junction, has applied for approval on plans for Rapid Creek Reservoir No. 3, in Mesa County. The water of Rapid Creek will be stored by a 40-foot dam, at a cost of about \$35,000.

It is reported that the Fountain Valley Land & Irrigation Company has placed bonds to the amount of \$500,000 for the purchase of 20,000 acres of land near Colorado Springs. Two new reservoirs are proposed.

G. V. Leach, of Denver, has made application for the segregation of 15,000 acres of land in Routt County. To irrigate this tract, and 35,000 acres between Craig and Twenty Mile Park, he proposes to construct an extensive system.

Plans for the Omer Canal & Reservoir Company's supply ditch, designed to irrigate 40,000 acres of land in Las Animas, Pueblo and Otero counties, have recently been filed. It is estimated that the cost of this ditch will reach \$150,000.

Failing to secure a reasonable bid on the enlargement of thirteen miles of the Montrose and Delta Canal, Uncompahgre Valley project, the Secretary of the Interior has authorized the Reclamation Service to perform the work by force account.

The Amazon Investment Company, of Denver, has asked permission from the state engineer's office to enlarge the

Brankamp reservoir in Adams County. The dam will be raised from 10 to 24 feet in height. The estimated cost is \$20,000.

The Model Land & Irrigation Company, of Denver, recently let the contract for building its concrete dam on the Las Animas River, near El Moro. The company is incorporated and has a capital stock of \$300,000. Eric Von Buddenbrook is president.

Preliminary maps for the Iron Ridge irrigation system, of Mercer, have recently been filed in Pueblo. It is planned to irrigate 2,000 acres, by constructing two reservoirs and seven ditches. Fred B. Martin and Floyd Hildreth, of Mercer, filed the plans.

The Farmers' Irrigated Land Company, an Illinois corporation, has filed its articles of incorporation with the county clerk at Colorado Springs. Capital is \$100,000. D. B. Kellogg, W. L. Kellogg, Jas. W. Kellogg and Samuel Block of Chicago, are directors.

Owners of 16,000 acres of land north of Wetmore will organize for the construction of two reservoirs, one in the North Hardscrabble Canyon and the other in the South Canyon. It is believed that water will be sufficient to irrigate an additional 4,000 acres.

The Secretary of the Interior has withdrawn from all forms of entry 600 acres in T. 45 N., R. 4 W., Sec. 11, Uncompahgre Valley. This land contains timber which is required in construction work in connection with the Uncompahgre Valley project.

During the month special bond elections have been held, as follows: Golden-Littleton irrigation district, \$550,000, for construction of reservoirs and ditches; Orchard Mesa district, \$175,000, for construction of additional ditches and improvement of present system.

Reports from Weld County indicate that there is great activity in the investigation of reservoir sites and water supplies. Several maps for proposed projects have already been filed with the state engineer. It is claimed that other projects are now in process of formation.

The Two Buttes Irrigation Company has recently let the contract for building its main canal and laterals to the McDowell Construction Company, at a cost of \$125,000. Dennis Gibbons has the contract for the dam at \$175,000. About 22,000 acres will be irrigated under this project.

Approximately 6,000 acres adjoining Rifle will be brought under water by a company formed by O. V. and J. M. Coulter. Preliminary filings and surveys have been completed. Water will be taken from Rifle Creek and carried to the Pre-Fountain Mesa. The estimated cost is \$200,000.

Harry B. Wilson, of Denver, has filed maps in the office of the state engineer, for the Grover Ditch and Reservoir project in Northeast Weld County, fifty miles from Greeley. Five thousand acres will be brought under water taken from the Crow. The estimated cost of this work is \$30,000.

Negotiations have been closed by the Denver Reservoir Irrigation Company for taking control of the Goodline ditch in the Pleasant Valley district. The company has also let a contract for the enlargement of Marshall Lake reservoir, at a cost of \$450,000. The work will be completed by March, 1910.

The Bar J. H. Cattle & Land Company has filed a map of Boone Creek reservoir and supply ditch from Haines Creek, to cost \$236,000. They will construct dams and reservoirs to store waters from Boone, Chico and Black Squirrel creeks. This system will be supplemental to that of the Chico irrigation system.

Thos. E. Wilkinson, a consulting engineer, of Denver, will have charge of the work for the recently organized Valley Irrigation Company, of Las Animas. It is planned to build a reservoir in Smith Canyon. Ditches will be carried through the break in the hills to the Hienan Flats and Mud Creek, in Bent County.

The Denver Reservoir & Irrigation Company has let contracts to the Kenefick-Quigley-Russell Construction Company for the enlargement of Milton Lake and the construction of 82 miles of irrigating ditches. It is estimated that the cost of this work will aggregate \$800,000. Contractors agree to complete same before April 1, 1910.

The Wet Mountain Reservoir Company have filed maps at Denver. The lands in Pueblo and adjoining counties on the south are to be placed under irrigation. Water comes from the St. Charles River, on which a dam will be con-

structed 186 feet high. The cost of the work proposed by this company will aggregate \$2,250,000.

The Kindred Irrigation & Power Company, of Steamboat Springs, has completed surveys for the reclamation of 55,000 acres of land southwest of Lay. It is proposed to construct a dam in Juniper Canyon. Ditches will carry the water to an upland between the Canyon and Maybell and Lily Park. Maps and plans have been filed with the state engineer.

The Pueblo-Rocky Ford Irrigation Company, successors to the Orlando Irrigation Company, has filed at Pueblo an amended map of Orlando Canal No. 5. This canal will irrigate 77,000 acres with water from the Huerfano River, and will cost \$285,000. The company is said to be composed of stockholders in the Anderson Hydraulic Construction Company, of Boston.

To increase its water supply for the 30,000 acres between Alamosa and Mosca, the San Luis Canal Company has decided to construct two new reservoirs, at a cost of \$500,000. Through the increased storage capacity, it is claimed that about 30,000 acres of land north of Alamosa may be supplied with water. Land owners in this latter section will be asked to give approval to the project.

Judge Shackelford has granted a temporary injunction restraining the Orchard Construction Company from building its dam across the Grande River. This work was contemplated in connection with the Orchard-Mesa project. The Denver & Rio Grande and the Colorado Midland Railways, plaintiffs, allege that the dam would result in annual inundation of their tracks near Palisade.

By an almost unanimous vote, stockholders in the Greeley-Poudre irrigation district confirmed the action of its directors in arranging a contract with the Laramie Poudre Reservoir & Irrigation Company for construction of a complete system of irrigation. It is proposed to build a three-mile tunnel from the Laramie to the Cache La Poudre. Bonds, as voted, aggregate \$5,100,000.

The Northern Irrigation & Power Company, in which well known Colorado and Eastern capitalists are interested, is planning the construction of an immense dam across Elk Creek, in Routt County. This structure will be 255 feet in height and the reservoir thus formed will have a capacity of 7,405,200,000 feet of water. The company proposes to irrigate nearly 100,000 acres of land, but detailed plans have not yet been completed.

P. H. Murphy, an attorney at Trinidad, has brought suit for the enforcement of the award of a committee chosen to arbitrate and fix the damage to the Murray ranch as a result of extension of the Model Land & Irrigation Company's ditch. The case has attracted considerable attention because of its similarity to others pending litigation. The company charged that the committee had failed to take the necessary oath before acting as a basis for its refusal to settle.

Directors of the San Luis Valley Land & Irrigation & Power Company were recently served with an order from the United States Supreme Court of Denver, restraining them from declaring forfeited their contract with A. C. Savage, of Adair, Iowa. Mr. Savage had failed to deposit the \$25,000 each month as specified in his contract, as fiscal agent. Directors of the company had notified him of their intention to break the contract because of his failure to comply with its terms. In securing the injunction, Mr. Savage stated that by the reason of "lavish expenditures" of the money secured from the sale of bonds, he was impeded in his work and was unable to sell a sufficient amount of bonds to keep the contract.

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IDAHO

Engineering parties are now making surveys for the proposed Black Canyon irrigation district near Caldwell. Local capitalists are said to be interested in the development. Plans for the district will probably be filed at once.

Yerkes & Armstrong, representatives of the Southern Idaho Reclamation Company, have asked for the segregation of 67,000 acres in the Sunnyside district. Water will be secured from Fall and Lime Creeks and the Boise River.

Col. E. R. Place and associates are investigating a project calculated to reclaim 50,000 acres in Jordan Valley. It is understood that preliminary plans locate the dam site on Jordan Creek. Jordan Valley business men are interested.

E. P. Coltman, L. A. Hartest, Barzilla Clark and O. A. Johnnesen, of Idaho Falls, have filed on 23,000 acres of land fifteen miles east of Blackfoot. It is proposed to irrigate by artesian water, with which experiments have been made to determine the feasibility of the plan.

Reports from Nampa state that there was much interest in the election for the purpose of authorizing bonds to the amount of \$80,000 for cementing two miles of the Nampa-Meridian canal. This work is necessary because of breaks which occurred last year and will probably be begun as soon as the bonds are placed.

The government has restored to entry the following described lands in Idaho: T. 23 S., R. 46 E., all Sec. 15; S. E. $\frac{1}{4}$ Sec. 16; E. $\frac{1}{2}$ Sec. 21; all Sec. 22; N. W. $\frac{1}{4}$ Sec. 27; all Secs. 28 and 33. T. 24 S., R. 46 E., N. $\frac{1}{2}$ Sec. 4; W. $\frac{1}{2}$ Sec. 5; all Sec. 6 and N. $\frac{1}{2}$ Sec. 7. These lands are no longer necessary to the interest of the Payette-Boise project.

Slick Bros., well known Idaho contractors, have the contract for construction of dams, flumes, ditches and rock work for the Weiser Land & Water Company. The contract calls for a dam in the middle fork of the Weiser River, about eight miles from Council. The company contemplates the reclamation of about 12,000 acres. Construction work will cost approximately \$300,000.

Officers of the Kings Hill Extension Irrigation Company, near Glens Ferry, have made a recent inspection of the stream, and state that water will be available for the season of 1910. Nearly \$200,000 has been expended in this work to reclaim 15,000 acres. It is claimed that other work not completed will cost a total of \$400,000. C. H. Hammett is president and G. W. Thompson, vice president.

Surveyors, said to be in the employ of the North Side Twin Falls irrigation project, are now engaged in making surveys of the district planned for reclamation by the Great Western Beet Sugar Company, commonly known as the Mountain Home project, near Pocatello. The latter company has recently gone into the hands of a receiver, and it is said that negotiations with the Twin Falls Company are pending.

Twin Falls capitalists have filed application for segregation under the Carey act of 90,000 acres of land in the Raft River valley. Part of the tract is in Cassia county, about 15 miles south of the Minidoka project and near Goose Creek and Oakley projects. It is proposed to construct a dam on the Raft River to supply water to reservoirs. Eastern capital is said to be preparing to interest itself in the company's favor.

The Secretary of the Interior has restored to entry the following described lands upon recommendation of the reclamation service, as being no longer necessary to the interests of the Payette-Boise project: T. 2 N., R. 3 W., S. W. $\frac{1}{4}$ Sec. 14; S. $\frac{1}{2}$ Sec. 15; S. E. $\frac{1}{4}$ Sec. 16; E. $\frac{1}{2}$ Sec. 21; All Sec. 22; W. $\frac{1}{2}$ Sec. 23; W. $\frac{1}{2}$ Sec. 26; All Secs. 27 and 28; N. E. $\frac{1}{4}$ Sec. 29; E. $\frac{1}{2}$ Sec. 33; All Sec. 34; and W. $\frac{1}{2}$ Sec. 35. These lands will become subject to settlement and entry upon such dates and after such notice and publication as the Secretary of the Interior may prescribe.

It is reported from authoritative sources that the Twin Falls-Bruneau project calling for the reclamation of near 650,000 acres of land, mostly in Owyhee county, is now practically assured. The segregation has been approved by the State Land Board and the Minidoka and Southwestern railroad has planned to extend the Twin Falls branch to Nyssa, traversing this district. F. H. Buhl, of Sharon, Pa., who has taken a prominent part in irrigation

affairs, is reported to have said that financial matters have been arranged. It is estimated that the cost will approximate \$10,000,000. The system of storage reservoirs extending to the headwaters of the Snake River will supply water. The point of diversion will be at Milner dam. A series of inverted siphons will carry the water from the Salmon River canyon to the Owyhee County canal. It is stated that the construction of this system involves many interesting engineering feats and that several years will be required before water is supplied. Mr. Buhl recently held a meeting with the state land board to arrange details of the projected work.

MONTANA

Farmers in the vicinity of Billings are considering the feasibility of pumping water from wells for irrigation purposes. It is said that artesian water can be secured at a maximum depth of 2,000 feet.

A damage suit of some importance to irrigators has been instituted at Missoula. Plaintiffs represent that Redmond, Michael & Flynn, owners of an irrigation ditch, have allowed rubbish and debris to accumulate therein. They ask damages of \$2,000 and an injunction to prevent further depreciations of this character.

The Secretary of the Interior has restored to entry the following described lands in Montana, upon recommendation of the Reclamation Service, as being no longer necessary to the interests of the Milk River project: T. 30 N., R. 37 E., Lots 1, 2, 3 and 6, N. E. $\frac{1}{4}$ of N. W. $\frac{1}{4}$ Sec. 15 and Lot 1 of Sec. 14. This land is embraced in H. E. 920 by Percy Martin, who is a member of the Lower Milk River Water Users' Association.

Thos. J. White, who constructed a portion of the Bitter Root Valley Irrigation Company's ditch near Hamilton, has recently secured the contract for an extension of this ditch to supply water to about 25,000 acres of land in what is known as the Eight Mile and the Three Mile countries. By the combination of the Como dam this company has an adequate supply for the added tract. Flumes and several pipe lines, aggregating 5,000 feet in length, are involved in this contract.

Alex McKenzie, a well known figure in North Dakota politics, is said to be considering the purchase of a large amount of stock of the Teton Cooperative Reservoir Company, in Teton County. For several years this company has been torn by internal dissensions. Local interests have been at war and the system of canals is not sufficiently completed for use. It is said that 120,000 acres can be irrigated if the system is extended along comprehensive lines. Mr. McKenzie proposes to expend about \$1,000,000.

NEW MEXICO

Application from the promoters of the Urton Lake project in the Pecos Valley has been approved by the territorial engineer. The company proposes to irrigate 60,000 acres.

Reports from Deming state that the number of acres to be watered from a central power plant has been increased to 8,000, and that there is prospect of additional territory.

The Uracca ranch in Colfax County, New Mexico, is now being irrigated by an extensive system, and it is claimed that within the next twelve months nearly 1,000 additional acres will be supplied with water. The present system will be enlarged and extended.

Reports from Moriarty state that E. A. Fisher, of Albuquerque, is investigating the underground water supply for a corporation which proposes to irrigate several thousands of acres by a pumping system on the Pecos River. Lands are located in the Estancia Valley.

Under direction of Engineer A. E. Rose, the Western Construction Company of Wichita, Kan., is now installing an irrigation plant at Portales to water about 10,000 acres. Fourteen inch wells will be driven and it is anticipated that by means of a central power plant these wells will each supply water for 160 acres.

San Juan County is said to be capable of irrigation and it is reported that several capitalists have made investigations. Authoritative reports agree that nearly 1,000,000 acres can be brought under water. Reports from

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The land is particularly adaptable to potatoes, field peas, alfalfa, wheat, barley, oats and other small grain, sugar beets, etc.

The Present Price of the Land and Perpetual Water Right is \$30.50 Per Acre

The cost of the irrigation system is assessed against the land at the rate of \$30.00 per acre, payable in ten annual installments, which, with the payment of 50 cents per acre to the State for the land, brings the cost per acre to \$30.50.

Where?

This tract of 150,000 acres of rich irrigated land is in Eden Valley, Sweetwater County, Wyoming, north of Rock Springs, which is an important City on the Union Pacific Railroad.

Now!

The land under the first segregation is practically all taken. There are some good tracts left, however, and within a few months there will be opened another tract for new settlers. Accordingly you must act at once.

Address for full particulars

Eden Irrigation & Land Company
First National Bank Bldg., Chicago

W. G. DeCelle, Vice-President and Gen'l Mgr.
Branch Office, Rock Springs, Wyoming

FARSON, SON & COMPANY,

FISCAL AGENTS, CHICAGO AND NEW YORK

Aztec state that there is great interest in the investigations now being conducted by private parties.

Italian capitalists at Albuquerque and from California have filed application papers for the Sandia Land & Improvement Company. A storage reservoir will be constructed at the mouth of the Tijeras Canon, six miles west of Albuquerque. The company controls 2,000 acres and is capitalized at \$250,000. It is said that more than 4,000 acres will be irrigated.

A. M. Patten of Denver has secured approval of his application for water rights in Bull Gap and tributary streams of Water Canyon, near Alamogordo, in Lincoln County. Five thousand acres of land are irrigable by the expenditure of \$110,000. The reservoir will be located two miles northwest of Oscur. Lands are said to be particularly adapted to fruit raising.

Application for water rights have been approved by Territorial Engineer Vernon L. Sullivan from the Amargo Ditch & Land Company for sixty second feet of the Navajo River on the Colorado-New Mexico boundary in northern Rio Arriba County, near Cumberland. It is reported that several small reservoirs are to be constructed at a cost of about \$40,000, and about 7,500 acres will be watered. Work will begin early in 1910 and must be completed within four years from that date.

In its application for water rights on the Gallinas and Sapello Rivers and the Pecos and Sanguijuela Arroyos to the amount of 80,000 acre feet, the Las Vegas grant claims priority over the government under the treaty of Guadalupe Hidalgo. It is claimed that about \$750,000 will be expended in the construction of an irrigation system east and south of Las Vegas. The largest of several reservoirs will have a capacity of 27,580 acre feet. The Sanguijuela and Sapello Rivers will be dammed. The main canal will be 58 feet wide and six feet deep.

UTAH

F. L. Sumpter and Mabel J. Betts, of Salt Lake, have made application for water rights on unnamed springs in Millard County for the irrigation of about 640 acres.

The Castle Reclamation Company, of Salt Lake City, has made application for ten second feet of the unappropriated water from a wash in Washington County, near Saw Mill Canyon.

The Mountain Home Irrigation Company, successor to the Coveville Irrigation Company, has recently filed articles of incorporation, showing capital of \$5,230. Jos. Biggs is president.

The Kelton Development Company, of Brigham City, has filed articles of incorporation for a general farming, real estate and irrigation business in Box Elder County. Capital, \$10,000. Jas. Jensen, president.

The Mitchell Hollow Irrigation Company has filed articles of incorporation. Stock is divided among local land owners. The company owns the water rights in Mitchell Hollow, in American Forks Canyon.

Application for permission to erect a dam on the Price River, in Emery County, and to construct dams and laterals for irrigation purposes, has been filed by E. Warren Stees. It is proposed to construct a dam across the river and to reclaim 60,000 acres.

The four-mile tunnel at Strawberry Valley project has been excavated 4,383 feet, the rate of progress for September being 370 feet. Labor conditions were not wholly satisfactory, due to the large amount of engineering and construction work going on in that part of the West.

George A. Snow, promoter of the Buckhorn Flats, in Emery County, is reported to have sold his interest to Chicago associates. Wm. Hall Thompson, H. M. Higginbotham and Gale Thompson are said to be the purchasers. The fact that these gentlemen were in Utah recently is considered proof.

Suit has been filed in the Fourth District Court by the Price River Irrigation Company against R. E. Benedict and Jas. C. Armstrong to amend the action of the state engineer in allowing the application of R. E. Benedict for 9,600 acre feet of water, to be taken from White River, a fork of Price River, to be stored in Utah Lake.

It is now reported that the Weber and Davis County project, which appeared to be in process of formation last

month, has been abandoned. Chas. C. Shepard, who was interested in the promotion of this project, is reported to have made the statement. It is claimed that because of misrepresentation and misunderstanding on the part of land owners, it has been considered advisable to abandon the project for the present.

Reports from Salt Lake City state that the Northwest Land Company, of Chicago, has filed on water rights on the Price River. About 70,000 acres in the vicinity of Woodside in Emery County are available for irrigation. A 600-foot dam across the Price River is proposed for the storage of water between March and November. After diversion waters will be carried through a system of flumes aggregating 56 miles in length. Horace W. Shelley, of Chicago, is chief engineer for the company.

Samuel Newhouse, who has filed on water rights for 200,000 acres in Wayne and Emery counties, is now seeking to interest capital in this project. A reservoir near the town of Thurber and a comprehensive system of canals and laterals is contemplated. At present the land is of little value because of lack of water, although it is said that engineers in the employ of Mr. Newhouse have submitted practicable plans for storage. In an interview, Mr. Newhouse recently stated that several millions would be required to construct the dam and reservoirs and that a considerable sum had already been interested.

OREGON

A Pendleton newspaper is agitating the formation of a co-operative company for investigation and recommendation on good irrigation projects. It is said that formal action in this direction may soon be taken.

It is reported that engineers are making preliminary surveys for the proposed Pine Creek irrigation project near Weston. Preliminary plans call for a dam on Pine Creek several miles above the city. Lands to the east and south of Weston will be irrigated.

The Idagon Irrigation Company, composed of capitalists at Boise, Idaho, is planning active work on the proposed dam on Sucker Creek. This company operates near Homedale, Idaho, where 50,000 acres are supplied with water. The Jump Creek dam is nearly finished.

The Desert Land Board is considering the advisability of extending the time given the Portland Irrigation Company to complete a portion of the work in Klamath County. It is reported that little work has been accomplished and that the company advances sufficient reason therefor.

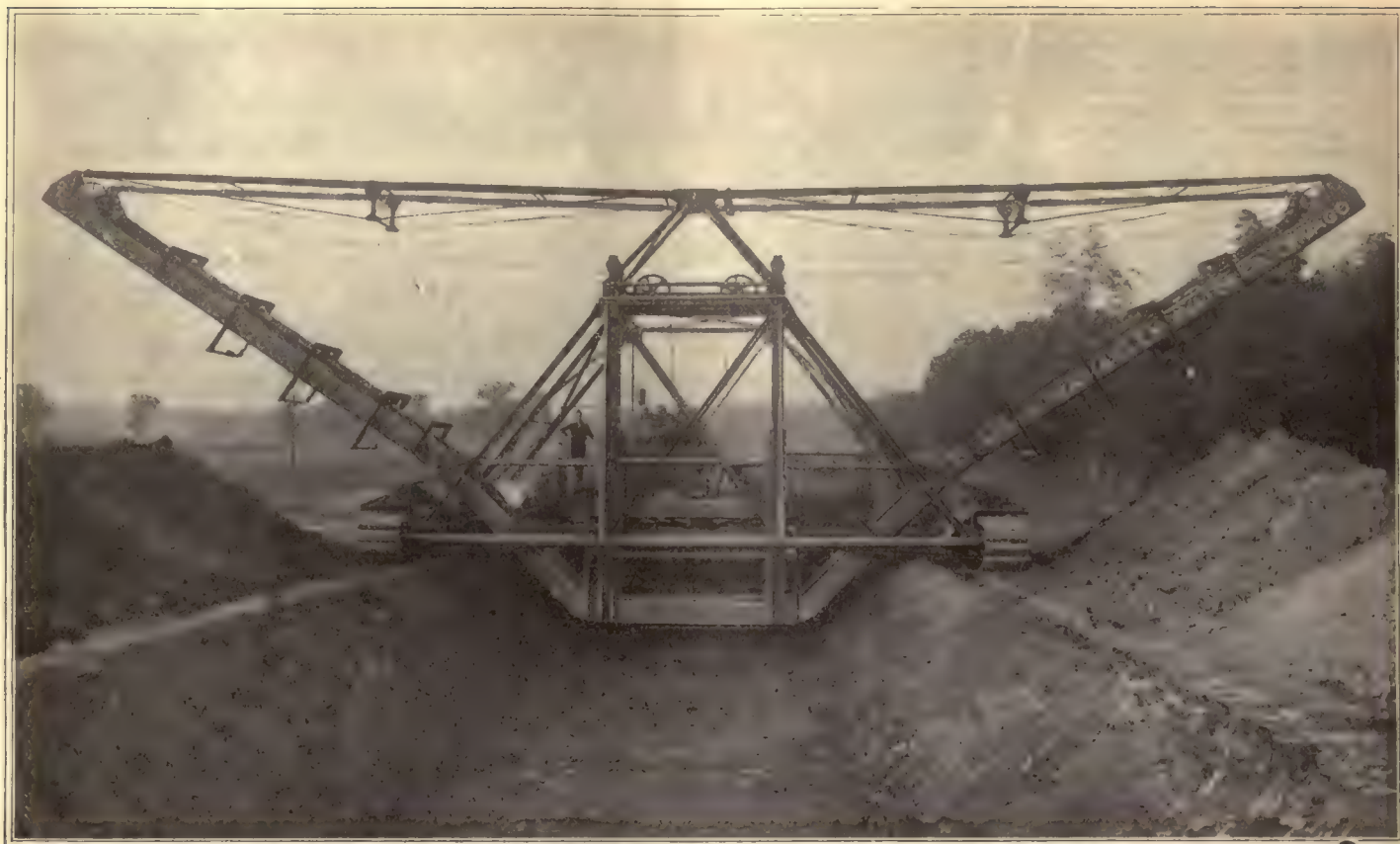
The Grande Ronde Reservoir Company of La Grande is planning the construction of its south side canal, of the Meadow Brook project. This canal will extend from the river north to La Grande and east toward Katherine Creek. It is proposed to complete the work early next year.

After long deliberations, the Desert Land Board has reached the decision that the Deschutes Irrigation & Power Company cannot demand an increased lien of 140 per cent or \$40 per acre from the settlers in this district. It is claimed that there will be further litigation as the result of this decision.

The Citizen's Committee from Grants Pass recently visited the Rogue River valley and secured signatures of farmers who desire to have water supplied to their land. A competent engineer has been secured and work is about to begin on a gravity ditch, which will water thousands of acres in the river bottom.

At the annual meeting of the stockholders of the Columbian Southern Irrigating Company, successor to the Three Sisters Irrigation Company, the acting president, T. W. Clark, recommended the plan whereby the annual flow of the Tumalo Creek might be stored in reservoirs, to be constructed at a cost of \$450,000.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 280-page finely illustrated work for new beginners in irrigation.



THIS CUT is a reproduction of a photograph of Type "A" **AUSTIN DRAINAGE EXCAVATOR**, operated by gasoline engine, cutting a ditch with an 18 ft. bottom, 1 to 1 slope. Note the Roller Platform Traction, which requires no track upon which to travel. Each traction has 81 sq. ft. of surface, and the units or panels making up the complete traction are so connected that the load is distributed over a multiplicity of units, hence there is no danger of miring in soft ground. It is also arranged to work on short curves.

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RAILWAY EXCHANGE **CHICAGO, ILL.**

WASHINGTON

Water from the ditches of the Fruitland Irrigation Company has arrived at Daisy. This canal is about 20 miles in length.

Engineer Jacobs has conferred with D. E. McEwen of the Quincy Valley Irrigation project and will soon start preliminary surveys.

The Smith-Cling Company, of Seattle, has purchased about 1,200 acres in the Moxee Valley, and proposes to irrigate by artesian wells.

Work on the pumping plant for the Pasco irrigation project at Pasco is progressing rapidly. The plant when completed will cost approximately \$60,000.

The Fruitvale Chamo Irrigation Company of North Yakima has made application to the secretary of state for an increase in the number of stockholders.

The Rose Land Company in Moxee Valley has arranged to open several thousand acres to settlement. Plans have been perfected to pump water for irrigation purposes.

The Palouse Irrigation Company proposes to make numerous improvements in its system three miles from Hooper. Work has been begun on extension and enlargement of ditches.

J. S. Malloy, associated with other capitalists, recently purchased 3,500 acres near Post Falls, and proposes to pump water from Hayden Lake for irrigation purposes. A large power house will be installed.

The Strahorn irrigation project of the Pasco Reclamation Company is now being pushed to completion. Many homeseekers are flocking to Pasco and adjacent territory. When completed this engineering work will irrigate 20,000 acres.

Michael Earles, president of the Hanford Irrigation & Power Company, with possessions in eastern Washington, has bought a controlling interest in the company. It is said that the North Coast railway attempted to secure control.

Noland & Thomas, contractors, are said to have arranged with the Pease Irrigation Company of Pasco for part of the work on the company's power site near Strawberry Island on the Snake river. This work will be prosecuted with vigor.

It is now claimed that representatives of the Klickitat Irrigation & Power Company, with headquarters at Seattle, has secured signatures representing about 100,000 acres of land for their irrigation project in the Prosser and Horse Heaven country.

The water right applications on the Sunnyside unit of the Yakima project number 1,204 and embrace 27,125 acres. During the month of September the government, through the Sunnyside canal, served a total area of 47,000 acres, including old water rights.

Ralph B. Williamson, attorney for the federal reclamation service, has received authorization from the attorney general to institute condemnation suits to obtain strips of land in Yakima county, Washington, along the Sunnyside canal to permit of its enlargement.

The Prosser Land Owners Association, recently organized, is said to have secured signature for 150,000 acres considered feasible for irrigation in the "Horse Heaven" country. This organization will assist the Klickitat Power & Irrigation Company of Seattle.

Holland capitalists are said to have made an investigation in the Moses coulee and adjacent river branches near Columbia with a view to irrigating about 8,000 acres, and planting orchards. A central pumping plant will be constructed if the investigations prove satisfactory.

E. F. Blaine, president of the Okanogan Power & Irrigation Company, has arranged to increase the water supply for irrigating lands in the Brewster flats. Engineers have made surveys and it is said that several thousands of acres will be brought under water during 1910. The present reservoir will be enlarged.

Samuel Hill and associates at Cliffs have purchased several thousand acres of land near that place, and are constructing a cement dam about four miles northwest of the city at the junction of two large canyons leading from the Klickitat valley. Through a system of canals this water will be supplied to the newly acquired lands.

It is reported from Colfax that the Palouse Power & Irrigation Company, which recently made application for right to construct a dam on Rock Creek at the foot of Rock Lake, has purchased a site from private property

owners and has begun construction. In this project the reclamation of about 12,000 acres is contemplated.

The secretary of the interior has decided that the proposals received for sixty miles of sub-laterals under the first section of the Tieton unit, Yakima project, are excessively high. Engineers estimated the cost of the work at \$11,344, while the lowest bid was \$23,750. The secretary has authorized the work to be done by force account.

The government engineer in charge reports the Okanogan project as 96 per cent completed, and the Conconully dam embankment 80 per cent. During the month of September 12,600 cubic yards of material were sluiced from the borrow pit, and 600 cubic yards were hauled by scrapers for the big earth dam. This structure now contains 267,000 cubic yards.

The Camas prairie country, fifteen miles northwest of Husum will soon be supplied with water. Wm. R. King, of Portland, has begun work on dams necessary to divert water from the Klickitat river at Glenwood. Ditches will conduct this water a distance of eight miles to the Camas prairie, ten miles long and three miles wide. This land was formerly used for grazing purposes.

The Seattle Chamber of Commerce has been requested to use its influence with congressmen and other government officials for the early completion of the United States project in Kittitas county. It is said that an effort will be made to have this part of the government project constructed before the canals in Benton and Yakima counties. About 70,000 acres in Kittitas county are available for irrigation.

Quincy Valley Water Users' Association and Joseph Jacobs, consulting engineer to the United States reclamation service, signed a contract at Morrison for the preliminary survey for irrigating the Quincy country, part of the Big Bend project, about 500,000 acres. Mr. Jacobs started work at once and will first cover the country to be irrigated south of Ephrata, Winchester and Quincy to the Chicago, Milwaukee & Puget Sound Railway Company's right-of-way.

Chiefs of the Yakima tribe in central Washington had a conference at Fort Simcoe, west of Spokane, recently to discuss the Wapato irrigation project, which will eventually supply water for 120,000 acres. They listened to explanations of the proposed work by Indian Agent Young. The matter of sending a delegation to Washington, D. C., to take the question of paying for water rights direct to headquarters, with a view to having the secretary of the interior or the president deal with the reclamation service, was mentioned, but no decision was reached. H. M. Gilbert, president of the Washington State Horticultural Association, and L. V. McWhorter made the chief addresses to the Indians.

Fifty farmers owning land under the Cascade canal in the Ellensburg district, west of Spokane, have decided to spend \$300,000 in improving the works to water 10,000 acres of land. B. F. Reed, president of the commercial club of Ellensburg, will soon appoint a committee to prepare plans and means of financing the project. Most of the owners favor an assessment against every acre under the canal, the rest of the money required to be raised by issuing bonds. The project calls for a tunnel from Dry Creek through the hills for more than two miles to a point near Indian Lake. Engineer Riddell, who made the survey of the line, reports that the distance is approximately 14,100 feet. At one point the canal tunnel will be 240 feet below the surface.

Wenatchee Canal Company, headed by W. T. Clark, formerly of Spokane, which owns a high line ditch of 40 miles in the Wenatchee valley in central Washington, has plans for improvement involving an expenditure of from \$75,000 to \$100,000. Plans have also been completed for the expenditure of \$65,000 next season. The work this fall and winter will be between Wenatchee and Cashmere. The company intends to replace the flume above Cashmere by running a tunnel through Cashmere hill next fall. This will be 5,000 feet in length and cost \$40,000. A ditch will be dug to replace other flumes and new flumes constructed at an expense of \$17,000. Six thousand feet of tunneling will be done the coming winter. The canal was constructed in 1903 through the sagebrush land, for years considered worthless. It is selling at \$1,000 an acre.

WYOMING

The dam under construction near Douglas, by the Platte Valley Land & Irrigation Company, is nearing completion. Water from the La Poudre and tributary streams will reclaim 50,000 acres.

Eastern capitalists were recently in Greyville, Wyo., to attend the mortgage sale of the Wiley irrigation project. It is claimed that they secured control and that work will be completed within a year.

The French Creek Irrigation & Development Company has matured its plans to reclaim 50,000 acres of land in the Platte Valley from waters in the French Creek. It is reported that the company is about to let the contracts for construction work.

Eastern bankers are said to have investigated conditions in the Buffalo Basin, between Worland and Meeteetse, with a view to the reclamation of 150,000 acres. W. H. Rohrer, of Chicago, was one of the party. It is claimed that an irrigation company has already been organized and preliminary work is now being done.

The Lake Hattie Water Company, formed to operate the Lake Hattie irrigation system in Albany County, has recently filed articles of incorporation showing capital stock at \$150,000. F. W. Bowen, president; W. R. Smith, vice-president, and N. E. Corthell, secretary; also constitute the board of directors for the first year. In its charter the company is empowered to own, operate and manage the Lake Hattie system, to collect charges for water and to acquire such property as necessary in the pursuit of this work.

The North Platte Valley Irrigation Company has taken over the plans and irrigation works of the La Prele Irrigation Company and assumed control. About 60,000 acres located in the valley of the North Platte are included in this project. Water will be stored on the headwaters of the La Prele River. The cost of this work is estimated at \$800,000 and involves the construction of a power plant. Much of this sum has already been expended and it is said that the company will complete the work within the next three months.

Appropriators of water from the Big Laramie in this state are planning to contest the right of the State of Colorado to grant water rights on this river. State Engineer C. T. Johnston, of Cheyenne, asserts that the entire supply has been appropriated in Wyoming and that there is every reason to believe that proceedings started to prevent the use of Laramie waters by appropriators in Colorado must result in suspension of Colorado claims. It is reported that Wyoming parties are prepared to institute proceedings at once before the United States court in order to prevent the financing of Colorado companies now planning to divert water from the Colorado section of the Laramie River.

MISCELLANEOUS

Engineers are investigating the feasibility of supplying water to 300,000 acres of ranch in the Boca Grande Valley in Mexico.

New York and Philadelphia bankers are said to have invested \$2,500,000 in bonds of the Arkansas Valley Irrigation Company, of Kansas.

The Colonial Land Company, of Lake City, Fla., has purchased the gravity canal and 16,000 acres of land at Bay City, Texas. The canal will be extended.

George W. Decker, of St. Louis, Mo., is said to be interested in a project near San Geronimo, Mexico. By an expenditure of more than \$1,000,000 they hope to reclaim 90,000 acres.

Reports from Chester County, Pa., state that the farmers are becoming interested in irrigation affairs and are endeavoring to find some means by which water may be stored and carried to their farms.

Water users in the proposed Rillito irrigation district, near Tucson, Ariz., are considering formal articles of incorporation with a view to perfecting this organization. They plan to irrigate by deep well pumping.

Water users in the Keith-Lincoln counties irrigation district, Nebraska, have employed an engineer to make surveys and plan improvements of its ditches. It is proposed to construct a tunnel through Sutherland hill.

News reports state that the South Gila project, below Gila Bend, Arizona, will soon be extricated from litigation, which has been pending for several months. This project involves the reclamation of about 20,000 acres.

Successful tests of deep well pumping for irrigation purposes in the Sulphur Springs Valley of Arizona, have induced many farmers to turn their attention to this method. It is said that several organizations will take action toward securing central pumping plants.

A competent engineer is said to have declared that two dams constructed on the Brazos River, about 100 miles northwest of Waco, Texas, would result in the reclamation of about 200,000 acres of arid land. Newspapers in this section are trying to interest eastern capital.

Land owners in Cimarron County, Oklahoma, are organizing to secure government assistance in irrigation projects. The organization is to be known as the Cimarron Valley Irrigation Association. J. A. Ellis has been elected president; Ralph Sloan, vice-president, and Ira Wolf, secretary and treasurer.

Rice growers on lands of the Louisiana Irrigation & Mill Company, near Crowley, La., are protesting against a water rent of \$6.00 per acre, as voted by directors of this company. Farmers assert that they will not cultivate their land if the company insists upon this rent. Heretofore one-fifth of the crop was given for the water right.

Farmers in Quaker Valley, west of Galena, Kans., will petition to government to supply water for irrigation purposes. It is claimed that the drouth of the past few years indicates that the rainfall is insufficient for crops. The Spring River traverses Quaker Valley and is said to contain sufficient water to irrigate the entire district.

Jas. Goode, of Pecos, Texas, is promoting a company to irrigate about 8,000 acres of land in the lower Pecos Valley. It is proposed to pump water from the Pecos River or to secure a supply from artesian wells. G. M. Noble, Scott Hopkins, C. Foote, J. W. Kelly, N. B. Burg and H. A. Heath, of Topeka, Kans., and Attorney J. S. Dean, of Marion, Kans., are said to be interested. Capital stock is placed at \$80,000.

Farmers and stockmen, of Leon Valley, Texas, are becoming interested in irrigation by pumping. Within the past few years there has been a decrease in yields because of lack of moisture. Reports from Waco state that land owners are considering the feasibility of pumping water from the Leon River. It is also intimated that a dam may be constructed by a privately controlled irrigation company in the near future.

The newly organized Barnes-Daily Power, Land & Irrigation Company, of Tucson, Ariz., is threatened with litigation involving a parcel of land abutting the junction of the Santa Cruz and Rillito rivers. Parties acquired an option on the land in question. When the option expired and before same could be renewed, it was purchased by H. J. Donau. The new owner proposes to restrain the company from developing its system.

Henry Esten, president of the Wadsworth Power, Light & Water Company, of Wadsworth, Nev., states that local farmers will apply to the government to place under irrigation a tract of 40,000 acres of fertile farming land in this vicinity. Surveys for canals and laterals have been completed by the government in connection with its Truckee-Carson project. Settlers will urge that the government give immediate attention to the Wadsworth district.

W. T. Sterley, general freight agent of the Denver & Rio Grande Railway, is authority for the statement that the Palo Duro Canyon, near Ft. Worth, Texas, can be utilized as a storage basin for water to irrigate nearly 1,000,000 acres of land in this vicinity. This canyon is about 138 miles in length and of varying width.

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(Continued from page 22.)

The investor and homeseeker is naturally interested in what has been done and what can be done in the country toward which his attention is called. However, it is impossible to fully outline all that can be said of this wonderful country. Only a personal visit and a thorough examination of its possibilities will suffice if an investment, or a new home, is desired. This is especially true of this locality, for Colfax county, New Mexico, had never been advertised until The French Land and Irrigation Company made its investment and put its lands upon the market. These lands, lying in the beautiful Antelope Valley, were as nature made them, rich in all the natural resources necessary to make a veritable "Garden of the Gods," waiting only for someone with pluck, energy and foresight necessary to develop them by putting on these lands the only element they lacked, an ample supply of water.

This The French Land and Irrigation Company are doing. That their judgment of the future possibilities of this valley is correct is evidenced by the results obtained in competition with other localities.

At the International Industrial Exposition, held at Albuquerque, N. M., September 29 to October 3, 1908, Colfax county, against very strong competition, took as a prize a \$400.00 silver cup for the best general exhibit, including education, mineral, live stock, agriculture and horticulture, and also took all the prizes for sugar beets. Colfax county also took first prizes for apples at the great expositions held at Chicago, St. Louis and Buffalo.

Judge Hugo Seaberg of Raton, the county seat of Colfax county, in a recent letter published in "The Earth" says "Everything is combined to make this county one of the most desirable places to reside in. A progressive class of people, a sunny, mild and healthy climate, surpassed nowhere, an abundance of good water furnished by its numberless mountain springs, brooks and rivers passing through the county, excellent schools and churches easy of access, quick and satisfactory newspaper service, telephone service to all parts of the country reached by long distance telephone, and a low rate of assessment and valuations for taxation purposes."

Situated in this county are the lands of The French Land and Irrigation Company. Bordering their land on the east is the main line of the Santa Fe Railway Company. The town of French is at the junction of the Santa Fe and the Dawson branch of the El Paso & South-western railways, which runs to the mining town of Dawson, with its population of about 9,000 people, engaged in mining coal and working in its immense coking plants.

On the west is the St. Louis, Rocky Mountain & Pacific Railway, running to Cimarron, a thriving, progressive city of about 1,000 population.

The towns lying near this tract and which furnish a market and trading place for the residents are French, Dawson, Springer and Cimarron, and Raton, the county seat, with a population of about 7,000, lies about twenty-five miles distant.

French is a new town, founded by The French Land and Irrigation Company, and has great future prospects, and is destined to be one of the best cities in New Mexico. Located at the junction of two railroads and surrounded by as fine an agricultural country as can be found anywhere, it affords the investor an unusual opportunity to get in on the ground floor, and to the business man a chance to start a business that cannot fail to be successful and limited only by the energy and intelligence that he puts into it. Go out and see this wonderful country, its great future prospects, and if you are seeking for an investment or a new home secure a piece of land or a town lot in French while the project is new and reap the benefit of the great increase in values that is sure to come.

The home office of The French Land and Irrigation Company is at French, N. M., and a branch office is maintained at 604 Atwood building, Chicago. A letter addressed to Sophus Richard, general manager of the company, at either office will be promptly answered.

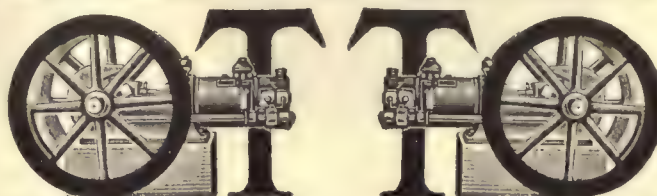
Mr. Richard is a veteran in the land business, thoroughly conversant with the value of real estate, and has a reputation for fair dealing.

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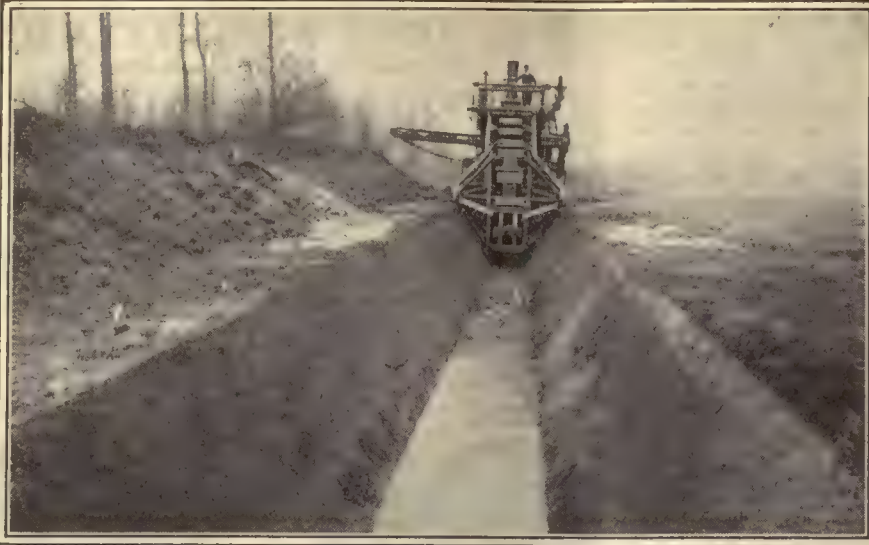
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Austin Drag Line Excavator

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A recent contract secured by the F. C. Austin Drainage Excavator company of Chicago, to supply one of its great machines for use on the mammoth works projected by a well known Mexican land company, has been the feature of the month in machinery circles of Chicago. The closing of the contract by the Austin company has attracted unusual attention to its product and has resulted in heavy inquiry from many western concerns now planning construction work for the irrigation of arid lands.

Officials of the Austin Drainage Excavator company state that their trade has grown enormously during the past few months and that it is with difficulty that their

The machine illustrated on the page is known as Type A. It consists of a frame made of structural steel, mounted on wide wheels far enough apart to straddle the ditch. On this frame is attached the engine and boiler, and other machinery which supports a "U"-shaped scraper bucket guide frame. The guide-frame as a whole can be moved up and down so as to ride clear of the surface or reach down to the bottom of the ditch. The width at the bottom and the angles of the "U" frame can be altered, increased or decreased, so as to give any cross-section slope of ditch desired, within ordinary limits.

The scraper buckets travel on the guide frame. There are two of them, facing in opposite directions and moving back and forth across the ditch like a shuttle in a loom, planing off a shaving of the earth down one side, across the bottom and up the other side at each trip. As the excavation deepens the guide frame is lowered, and as the scraper buckets cannot depart from the line of travel it is evident that they cannot cut a channel otherwise than true as to slope of sides, width of bottom, or depth.

Where the material to be handled is sticky a single special automatic reversible positive dumping bucket is



The illustration is a reproduction from a photograph of the Type "A" Austin Drainage Excavator mounted on rolling platform traction instead of track, each side of the machine having a bearing surface of 81 square feet, hence will travel over soft ground without much trouble. The cut also shows the different sized ditches that the machine is capable of digging. The first cut is an 18-foot bottom. The upper ditch is 4-foot bottom, about 8 feet deep and 1 to 1 slopes.

shops are able to supply the demand. A large number of its machines are now in operation in various parts of the west and the south. Because of the fact that the excavator can be utilized both for the construction of drainage ditches on swamp lands, and irrigation ditches on arid tracts it is now in use in nearly every state in the union.

Chief among the valuable qualities of the Austin machine is its adaptability to the character of the projected work. It can be easily adjusted to the exact width of ditch desired, as pictured in the accompanying cut. When dug by this excavator, ditches retain their original dimensions for years without becoming obstructed with earth from caving banks, drift or silt. Its excavations are true to grade, properly sloped and the spoil banks are deposited well back from the channel.

substituted for the regular equipment. The positive cleaning feature is worthy of note. The construction is such that each time the bucket crosses the ditch it fills, runs out to any desired distance and is discharged of every particle of its load, no matter what the nature of the soil may be. It is impossible to return the bucket until the contents are absolutely all out.

The banks and bottom are by this method cut perfectly smooth and true to grade. The berm can be made practically any desired width, and waste banks or dykes built a sufficient distance from the ditch to prevent their return to the channel by erosion to interfere with the free flow of water. The center of the ditch is always the lowest point, so that during dry seasons the stream follows a

(Continued on page 56.)

(Continued from page 16.)

The phosphates act much like the nitrates, their acid forming a constituent of the plant.

The proper, proportionate quantity of all these salts in the soil, is generally in the order already given; the carbonates in the greater quantity, the nitrates in less quantity, and the phosphates least. The quantity of any salt which may be used to advantage, however, will depend upon the demands or necessity of the plant which will show for itself the salt proper for its well being and perfection.

To still further simplify the idea of the use and operation of these salts and their necessity, it will be well for the reader to again imagine a similarity between the plant and an animal. The stomach of the animal secretes, or produces, gastric juice and other acids which come from

and other acids of the animal stomach, convert it into prepared food, so to speak, and the plant absorbs it, is nourished by it and grows to maturity.

Silicates An Essential to Fertility.

There is one important prevailing element in all soil which can neither be overlooked nor ignored, in fact, its power of fertility is unlimited; we refer to silicates. Salts are spoken of as the inorganic substances acting upon humus or organic matter to produce nourishing foods that can be absorbed by the plant, but behind these salts, there is another substance which really constitutes the framework of the plant structure, the bony framework of the plant, the sinew of the soil.

Silex, or silica, which is the earth of flints, is, in its pure state, a perfectly white, insipid, tasteless powder. Glass pulverized is an illustration, so also is a sand heap.

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THE WESTERN WORLD, the only journal published which reproduces the records of the Government Land Office, showing by maps and plats exactly what land is open for homestead or desert entry; makes it so plain that you can go out and select your **own free farm** from among Uncle Sam's remaining unentered lands. It shows from 500,000 to 1,000,000 acres in each issue, giving accurate soil description. It tells you how and where to get a 320 acre homestead, which is yours for the asking. It tells you all about Indian Reservation openings.

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In order to make this offer especially attractive, the publishers of these two great journals offer to all who subscribe before January 1st, 1910, the following proposition:

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112 Dearborn St., Chicago, Ill.

practically similar salts, by the action of which the organic matter—the meat and vegetables—put into the stomach, are digested and distributed to nourish every part of the body. If there were no gastric juice, or other acids formed from the salts of the body, the organic matter put into the stomach could never become food, and the body, left without nourishment, would starve and die.

So it is substantially with plants. The main difference being that the plant has no stomach within itself, but it requires food just the same as the animal, and if it does not receive it, it starves and dies. By the active principle of life in the plant as in the animal, the salts of the soil are brought into the presence of each other to form acids which act upon the organic matter in the soil, or the humus, in very much the same manner as the gastric juice

But earth of flints, sand heaps, are barren and worthless, as much so as a peat bog; but put the two together, and there is astonishing fertility. The silica unites readily with the mineral substances or bases, forming what are called "neutral salts," to which is given the name "silicates." Thus we have the silicate of soda, of potash, of lime, of magnesia, of alumina, of iron and of manganese, a class which forms the great bulk of all rock and soil.

The action of the silicates is simple and easily understood. When humus, or decomposed organic matter—manure for instance—is mixed with silica, that is added to a common sand heap, there is an immediate decomposition of the silicate of potash, which we have said is a neutral salt, and it becomes an active salt of potash which

(Continued on page 53.)

New Passenger Train Equipment for Harriman Lines

Continuing the policy of the Harriman system and catering to the wishes of the traveling public that safety, speed and comfort be provided, lead to the adoption of all steel, fireproof passenger equipment.

Steel, entering so largely into the best forms of mechanical and architectural structures, was decided upon for future cars in preference to continuing the building of the wooden type of cars.

At its best, the wooden car cannot be considered as a solid unit and especially so when compared to the substantially built steel car, with its steel sides and other members securely riveted together. The absence of wooden sills, flooring, etc., completely eliminates all danger from such source to passengers if trains should collide. The strength of the new all steel equipment affords all possible protection

ment consisting of all steel postal, baggage, chair car and coaches, will constitute trains of unequalled construction, beauty and strength.

All cars of the new equipment are, so far as possible, of uniform design. The sides, ceilings, partitions and doors are made of steel plates reinforced by steel posts and braces, forming practically a unit construction.

The underframing of car consists of heavy steel



Exterior View of Baggage Car.



Interior View of Mail Car.

to the passenger. The addition of all steel dining and observation cars now under consideration, to the present equip-

beams braced throughout with diagonal and cross members. The ends of underframing are reinforced with heavy steel castings; the ends of car bodies are provided with heavy angle iron posts and braces, all securely held together with heavy steel plates.

All cars are provided with the most efficient heating and lighting system and are heavily insulated throughout with hair felt. A duplex lighting system, consisting of gas and electricity, is provided on all cars.

A most commendable feature is the omission of the upper deck type of roof and its accompanying draft producing ventilating sashes. The roof of the new equipment is semi-elliptical in shape and the ventilators thereon are unequalled for efficiency and appearance. The production of a draft throughout the car which would mean discomfort to the passengers, is an impossibility.

All cars are equipped with cast steel trucks.

The steel postal cars are sixty-three feet long, over platforms, when coupled, and weigh approximately 108,000 pounds. Baggage cars are of the same length and weigh approximately 90,000 pounds. Coach and chair cars are sixty-seven feet nine inches over platforms when coupled, and weigh approximately 94,000 pounds. Seating capacity of coach, seventy-two; of chair car, sixty.



Exterior View of Passenger Coach.

Irrigation Bonds should have first consideration by those investors who are acquainted with the Great Land Values that are being created through Irrigation in our great West

Banks, Insurance Companies, Trust Companies, Fraternal Orders and the most conservative Eastern investors are the heaviest purchasers of our irrigation securities. They buy Municipal, Carey Act and Corporation Irrigation Bonds. The following letter written by our Mr. Farson summarizes the facts concerning Irrigation Bonds:

CHICAGO, November 13, 1909.

FARSON, SON & Co.,
NEW YORK CITY.

Gentlemen:—For thirty-five (35) years my life work has been the study of investments. During this time I have sold many millions of bonds, issued for almost every conceivable legitimate purpose.

In the early days, when I visited Savings Banks and Insurance Companies in New England, I found great objection to WESTERN securities, and had to talk very earnestly in many cases to sell these excellent people bonds issued in IOWA, ILLINOIS, WISCONSIN, MICHIGAN and INDIANA, carrying SEVEN and EIGHT per cent interest, issued for SCHOOL, BRIDGE, COURTHOUSE and similar purposes. Such issues sell these days quickly on from a 4 to a 4.50 per cent basis.

This same objection obtains today against bonds issued in the states farther west, and yet, we know that as a matter of fact, securities issued in Montana, Washington, Idaho, Utah, California, Colorado and Oregon, are just as good in every respect as bonds issued in the Eastern states.

One of the great developments of the last few years has been on IRRIGATION lines, and as astonishing as the statement may seem, MY ASSOCIATES AND MYSELF HAVE, TO DATE, RECLAIMED MORE LAND THAN HAS THE GOVERNMENT OF THE UNITED STATES ITSELF.

I give it as my deliberate judgment, after the most careful examination, that properly issued Irrigation bonds have MORE security back of them than any bonds I have ever sold, and I UNHESITATINGLY RECOMMEND THEM to my most conservative clients.

Yours truly,

JOHN FARSON.

Upon request we should be pleased to furnish you full information concerning irrigation bonds, Circular 10340. If you hold securities netting you from 3% to 4%, we especially invite your correspondence with a view to increasing your income by the exchange of your securities. **We are the leading dealers in Irrigation Bonds.** We buy these issues outright and have at all times an excellent assortment of these securities paying from 5% to 6%.

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GRAND VALLEY FRUIT AND WATER COMPANY.

About forty miles west of Grand Junction, Colo., on the main line of the Rio Grande Railroad in Grand county, Utah, the Grand Valley Fruit and Water Company is developing an irrigation project of considerable magnitude. During the past month the company has issued a neat booklet giving accurate information as to the wonderful fertility of its land in this district.

Because of the high altitude and the warm sunny days, the Grand Valley section has produced abundantly of fruit and vegetables. The Grand Valley Fruit and Water Company has constructed a substantial irrigation system in this valley and is preparing to sell ten-acre tracts near the town of Cisco, Utah. It is announced by officials of this company that many sales have been made during the past few weeks and that the tone of the inquiry proves that there is great interest in these lands.

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—Make The Most Perfect Seed Bed

ALL by going over the field **once only** with your sulky, disc or gang plow and the Kramer Rotary Harrow Attachment. It levels, pulverizes and makes a mulch of the "moist soil" that is not possible after the ground dries and "sets." Use the original and only successful machine of its kind,—The

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So light-running that horses hardly notice additional draft. Made in styles and prices to suit every farmer. Implement Dealers everywhere sell on easy and reasonable terms—no freight to pay.

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Shows how the Kramer Rotary Harrow Attachment more than pays for itself in one season. Gives all the facts and figures—reports from Agricultural Colleges and Experiment Stations to prove our claims.

Let this book show **you** the way to better crops, less work, less hired help. Write us today. Ask for Free Book No. 91.

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Every gate machined absolutely water tight and made to be depended upon. Northwestern Iron Headgates cost little more, but more than pay for themselves by saving water that is usually lost by leaky wooden headgates. They are easily operated, never stick, and are used by large irrigation projects and irrigators all over the country. Making a specialty of iron gates, I can quote close prices and make gates especially adapted to your purpose. Investigate at once.

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showing gates for every purpose, pressure, size and price. Every irrigation engineer and irrigator should write for one today.

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(Continued from page 18.)

results. To the man of small means who desires to secure a home of his own, the Huntley project offers a most inviting opportunity at the present time.

Sun River Project, Montana.

Located in the northern part of the state, near the rapidly growing city of Great Falls, the Sun River project is attracting a very high class of people who are making a garden in the desert. To the man who is accustomed to the vigorous climate of New England, or of Minnesota and Wisconsin, this section is peculiarly attractive. The lands are covered with bunch grass and blue-joint, furnishing excellent grazing. There is no sage brush to clear and but little leveling to do to prepare land for irrigation. The farms are 80 acres each of irrigable land, and in addition each homesteader may secure another 80 acres of unirrigated land without charge. Considering the low price of water-right, only \$30 per acre payable in ten years without interest, this may be regarded as an exceptional chance to secure a home in a section which is rapidly growing.

Lower Yellowstone Project, Montana-North Dakota.

In the lower valley of the Yellowstone, in Montana and North Dakota, are 66,000 acres of choice land embraced in a Government project. While all of the land has been filed upon, there are opportunities of purchasing from present owners, many of whose holdings are in excess of the limit of 160 acres prescribed by law. These lands are held at such reasonable prices that settlers who desire to locate there, and who have exhausted their home-

stead rights, can secure sufficient acreage to establish a home. A new railroad is being built down the valley which will afford first-class transportation facilities for crops. Bountiful crops were the rule this year.

Detailed information regarding these projects and others which have been completed or are being constructed will be supplied upon application to the Statistician, U. S. Reclamation Service, Washington, D. C. The very large number of inquiries which are being received indicate a wide-spread interest on the part of the public. As the opportunities on these projects for homeseekers are not unlimited, it is probable that ere another year has passed all the lands described above will be taken up.

(Continued from page 21.)

possesses the greatest hot springs in the world, including those of the Yellowstone National Park, Thermopolis, there are experts in land and legal matters who are available for answering questions on the homestead laws, and the methods of acquiring title under them. Lectures are also being delivered at various state and county fairs and Saratoga, Alcova, and many others. The springs at Thermopolis in the northwestern part of the state are perhaps the most remarkable in the world. Sulphur, asbestos and plumbago are being mined, and the districts where these minerals are found would be fully developed at this time if transportation facilities had been furnished at an earlier date.

Information relative to the various resources of the state, together with the opportunities for investment will be furnished those who make inquiry to the Wyoming State Immigration Commission, Cheyenne, Wyoming.



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THE BROTHEN AUTOMATIC LEVEL

The Modern Leveling and Ditching Instrument

So simple that any man can use it. It will give automatically the dead level or any grade and also distances. The only instrument which will prove the correctness of its work from the point where it is operated.

The instrument is fully guaranteed.

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For Information and Literature, address

A. A. BROTHEN,
Idaho Falls, Idaho

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(Continued from page 48.)

dissolves the humus, or organic matter and fits it for plant food. So the same process goes on with the other silicates as the various plants growing in the soil may demand for their nourishment. They are converted into active salts, which are capable of dissolving organic matter, whereas, as neutral, inactive salts or silicates, they are powerless to act.

Were it not for these silicates, the various active salts and acids would lose their virtue, but as it happens, the silicates hold them in a firm grip, intact, until the action of plant life demanding food, sets them free to aid in preparing plant food.

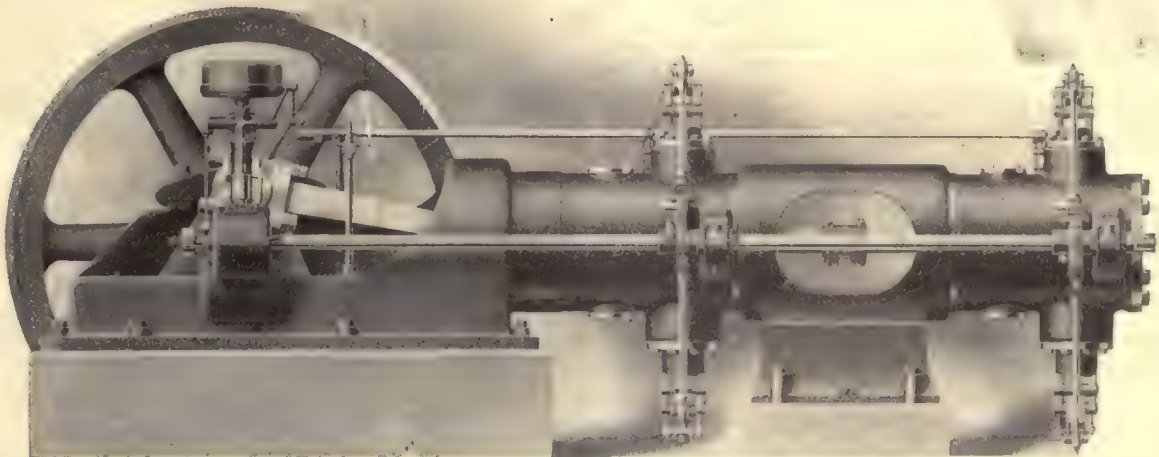
The base, or fixed element of the earth called silix, or silica—keep in mind a sand heap and it will be easy to remember—is “silicon.” It is pure rock crystal, common quartz, agate, calcedony and cornelian. All these are silicon acidified by oxygen, and hence called silicic acid. It is this which forms, with potash, the hard coat of the polishing rush, the outer covering of the stalks of grasses. It is the stiff backbone of cornstalks which stand sturdily against the blast. Wheat, rye, oats, barley, owe their sup-

port to this silica, and where grain is said to “lodge” during a heavy storm, the trouble may be traced to a deficiency of silica in the soil. It cases the bamboo and the rattan with an armor of flint so hard that from it sparks may be struck. Entering into the composition of all soil, and hard and unyielding as it appears, forming not only the solid rock, but the delicate flower, combining with the metals of soil whose gradual decomposition is the birth of fertility, silica, or the sand heap, may well be likened to the bony structure or framework of the animal.

The next chapter on particular soils will give, more in detail, the component elements which enter into their composition, and present a series of tabulated analyses showing proportions favorable to the growth of various products.

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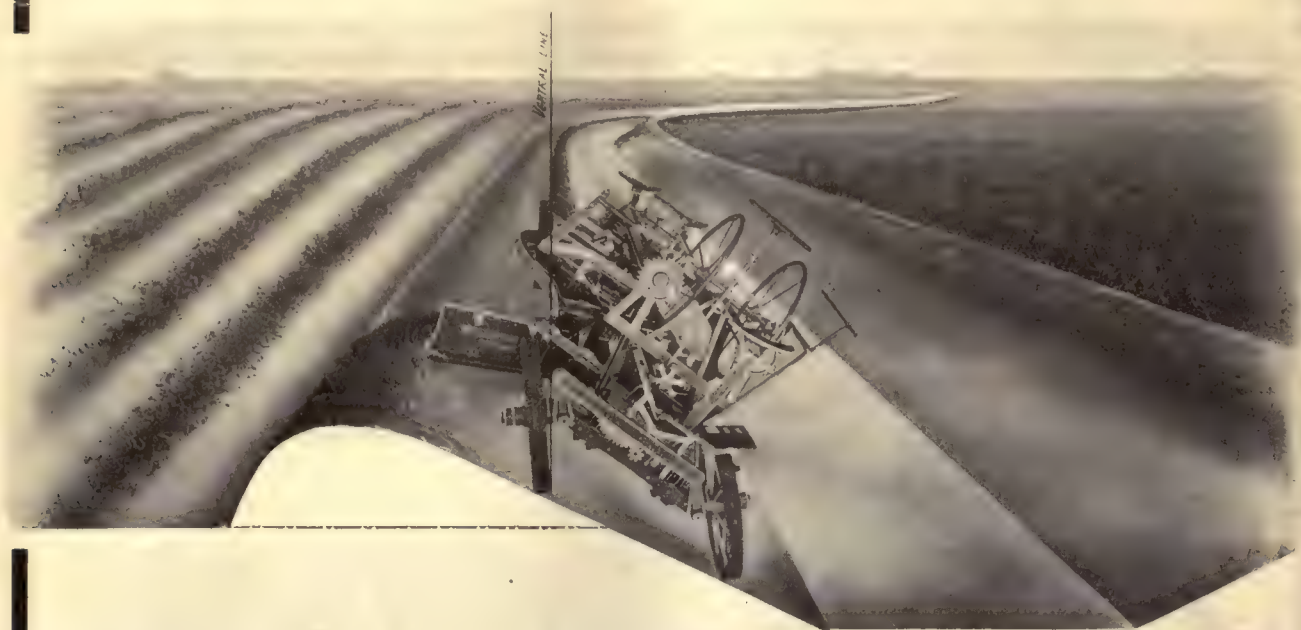
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U. S. RECLAMATION DITCHER

This type of machine is different from all other ditching machinery, in that it plows the dirt out of the ditch with a continuous sweeping motion, whereas all other machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The cost therefore, per cubic yard, of excavating with the U. S. Reclamation Ditcher is necessarily much less than with any other tools or appliances.

The Reclamation Ditcher is adapted to cutting ditches as deep as three feet below the original surface and as wide as ten feet at the bottom and with sides sloped as steep as 2 to 1.

It has adjustable oblique wheels which perform the same function as the oblique wheels of a sulky plow. They are simply rolling landsides which counteract the side pressure of the earth on the mold and also make it possible for the machine to be operated on the sloping side of the ditch as shown in the cut.

It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

The difference in cost of cutting ditches with the Reclamation Ditcher and any other form of machinery is sufficient to pay for the machine very quickly. We absolutely guarantee this and will prove it to you by a demonstration of the machine on your own work before you accept it.

Write for descriptive folder which gives diagrams of ditches and cost estimates.

J. D. ADAMS & CO., Indianapolis, Indiana

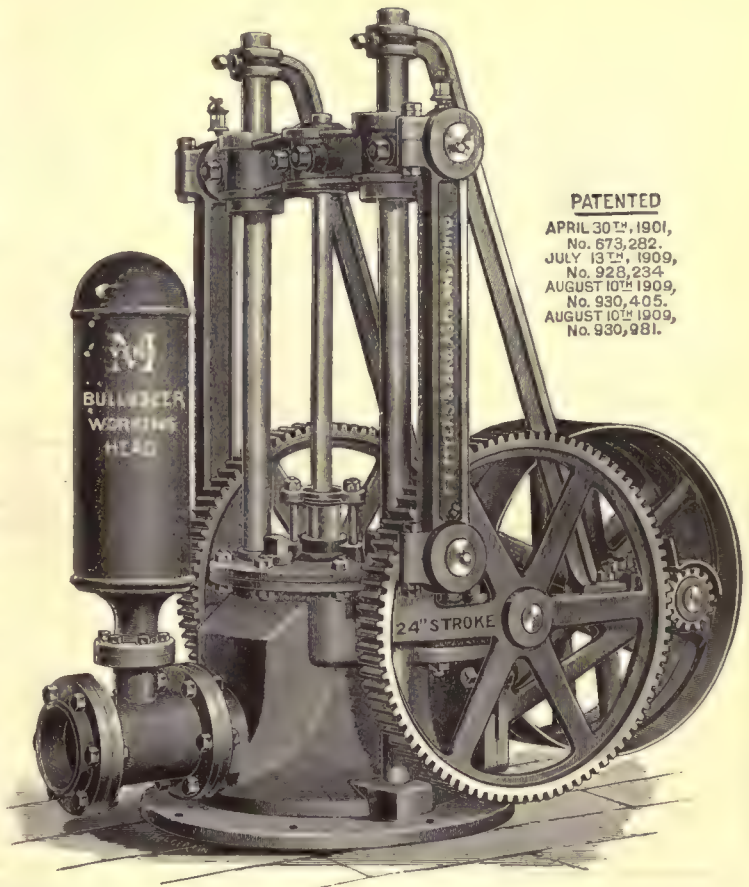
MYERS BULLDOZER POWER WORKING HEAD.

The accompanying cut is an illustration of the Myers Bulldozer Power Working Head, designed especially for pumping purposes, for which the makers claim the widest possible range of use, being adapted to wells of great depth and equally efficient in delivering water to high elevations, all of which requires a construction of great strength in all its parts and arranged with special care with regard to endurance when kept in continuous use, as is often required from a working head of this class.

It is claimed that this working head for a pump has such a construction that the several parts can be readily removed to permit of access to the interior of the head whereby the working parts can be removed without disconnecting the discharge pipe from the base, without loosening the fastenings that secure the base to the platform or other supporting structure, and without disconnecting the driving mechanism; the construction admitting of a very short base so the operating mechanism is located close to the supporting surface, being simple in construction and operation. The power is applied close to the base, and bronze boxes operate on the wrist pin and cross-head pin. A strong claim is made that the entire machine is self-contained, complete within itself, so that it is only necessary that the base be properly fastened to the platform, when it is ready for operation.

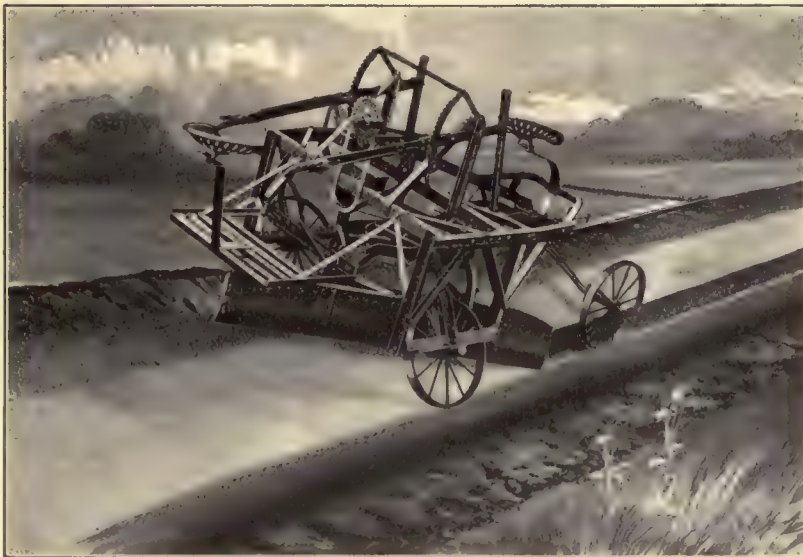
This working head can be furnished with a balance wheel, differential, and air chamber; it has a 24-inch stroke, and is especially designed for a heavy duty service.

Full descriptive matter will be furnished by the makers, Messrs. F. E. Myers & Bro., Ashland, Ohio, upon application.

**PATENTED**

APRIL 30TH, 1901,
No. 673,282,
JULY 13TH, 1909,
No. 928,234,
AUGUST 10TH 1909,
No. 930,405,
AUGUST 10TH 1909,
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The Little Roadster Grader and Ditcher



THE LITTLE ROADSTER

A New, Light Ditch Plowing Machine, Especially Designed for Cutting Small Laterals on Irrigated Farms, and Ditching and Grading Roads.

This type of machine cuts ditches for less money than any other tool or machinery, because it plows the dirt out of the ditch with one continuous motion, whereas all other ditching machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling landsides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

EVERY IRRIGATED RANCH OR FARM NEEDS ONE OR MORE OF THESE MACHINES. IT WILL QUICKLY PAY FOR ITSELF. SEND FOR DESCRIPTIVE FOLDER AND LET US TELL YOU MORE ABOUT IT

J. D. ADAMS & COMPANY, INDIANAPOLIS, INDIANA

(Continued from page 47.)

straight line and the ditch actually cleans itself, so that it is at all times ready to take care of heavy rainfalls. The carrying capacity of a canal made by the Austin Drainage Excavator is from twenty to forty per cent greater than that of canals of the same size made by ordinary methods. The excavator is constructed of steel throughout and is practically indestructible. While it is essentially an earth-handling machine yet it will take out boulders, stumps and roots if they are not too large, and being very strong it is not apt to be injured by these obstructions.

It propels itself upon a temporary track, and is so arranged that it can be operated either backward or forward, thus relieving the ditch of the weight of the machine. This is a desirable feature when passing over swamps, bogs or light bottoms which are covered with water when the machine enters them. In this country nearly all drainage canals run through soft marshy places, and in order to work to the best advantage there should

be sufficient fall to the ground so that when work is commenced at the outlet the water will drain off ahead of the machine and permit the soft ground to dry out before the excavator reaches it.

Instead of the above a rolling platform traction is sometimes desirable, particularly where the yardage is light, as is the case in the construction of shallow canals and ditches. When so equipped these excavators require but two men on the pay roll for each working shift.

The capacity of the machine varies according to the size of canal, but under favorable conditions, and character of material with Type A machine, it is possible to excavate from 1,900 to 2,300 cu. met. in twenty working hours. It is customary to have two operating shifts, one for day and one for night work, but this output may be curtailed or increased, according to the many conditions which govern a given case.

The estimated cost of operating the machine for a
(Continued on page 57.)

Mayer

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PROSPECTORS' and MINERS'

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Expressly adapted for irrigation work. Made of the highest quality and stock. Strong, comfortable and dependable. Many styles. Protect the feet and keep them dry. Can be secured through shoe dealers. If not obtainable, write to us.

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TRUMP TURBINES



When used for driving centrifugal pumps for irrigating purposes, either direct connected horizontally or vertically, or for furnishing power through other types of transmission, will be found to be the most economical and highest grade type of water wheel machinery manufactured in this country. These turbines are adaptable to the severest of conditions.

We build all water power appurtenances, such as Head Gages, Head Gate Hoists, Piping, Etc. Send your inquiries direct to us. Our illustrated catalog for the asking.

THE TRUMP MFG. CO.
Greenmount St., Springfield, Ohio

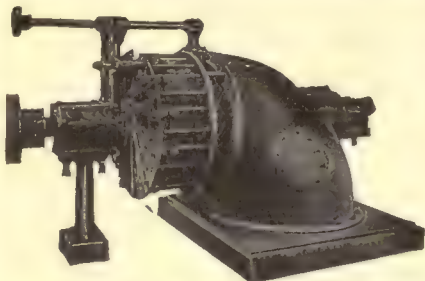
Books on Irrigation and Drainage

The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
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Irrigation (as a branch of engineering), Hanbury	
Brown	5.00
Earth Slopes, Retaining Walls and Dams, Chas.	
Prelini	2.00
Road Preservation and Dust Prevention, Wm. P.	
Judson	1.50
Practical Farm Drainage, Chas. G. Elliott.....	1.50
Drainage for Profit and Health, Waring.....	1.00
Farm Drainage, French.....	1.00
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Cement Pipe & Tile, Hanson.....	1.00

The Irrigation Age Company,

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SAMSON TURBINE

When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

JAMES LEFFEL & CO., Springfield, Ohio, U. S. A.

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(Continued from page 56.)

day and a night, based on prices paid in this country, are as follows:

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The Sheffield Gas Power Company, of Kansas City, reports the purchase at bankruptcy sale of the plant and assets of the Weber Gas Engine Company. During the receivership of the latter company the plant has been in constant operation through the agency of the Sheffield Gas Power Company. It is announced that the sales and factory departments will be placed in new hands and that the management will vigorously push the sales of Weber gas engines and gas producers.

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(Continued from page 32.)

there are experts in land and legal matters who are available for answering questions on the homestead laws, and the methods of acquiring title under them. Lectures are also being delivered at various state and county fairs and expositions in the Middle West. The publicity campaign will be carried on systematically and continuously to the end that all the people of the country may be informed of this great paternalistic work of the Government. To every dweller in the crowded cities, every rent payer who hopes at some time to own a home of his own, and every seeker after health such as life in the open brings, will be carried the glad message that the Government itself stands ready to assist him to secure a "vine and fig tree" of his own.

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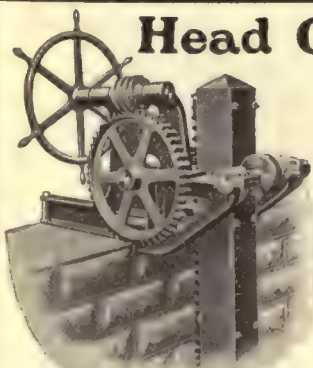
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Land in this great country is going fast. If you have any thought for the welfare of yourself or children, find out all about this opportunity to-day.

Send for our new folder with large map, and also folders issued by the private irrigation companies and by the United States Government Reclamation Service giving all information about these lands, terms, etc. Free for the asking. Study these folders and then come with me on my next excursion to the Big Horn Basin and see for yourself. My excursions, which I personally conduct, leave Omaha on the 1st and 3d Tuesday each month, on which days reduced railroad rates are in effect. My services are free to you.



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PERSONAL MENTION.

Ira W. McConnell, supervising engineer in charge of government work in Colorado, Nebraska, South Dakota, Kansas, Oklahoma and southern Wyoming, has resigned his position to accept a more lucrative position with a private concern. Mr. McConnell entered the service in 1903 and soon thereafter was made resident manager of the Umcompahgre project in Colorado. In connection with his resignation officials in the reclamation department at Washington assert that each year brings added difficulties in securing competent engineering ability for government work.

As official representative of the government at Santiago, Chile, Alberto Alibaud has been making quiet but extensive investigations of the irrigation projects in this country. Several months ago he left Washington, D. C., and after visiting many points in the northwest is now finishing his trip through the southwest. In a recent interview he stated that Chile presented many of the topographical features to be found in the district west of the Rocky Mountains, and that for this reason his government had deemed it advisable to secure detailed information as to the methods of irrigation in the United States. He will return to Santiago about January 1 to present his report in official form.

That Russia is evincing great interest in American methods of irrigation is shown by the presence in the United States at the present time of three official representatives of that government. Tihon Polner, secretary of the Zemstvos of the Russian empire, and F. Van Kesel Renard, secretary of the imperial Russian Consulate at Montreal, have been traveling extensively in the west and recently were in California. Aside from irrigation matters, these representatives are studying colonization and agricultural methods and upon their return to Montreal will make a detailed report of the investigations. E. Skorniakoff, an eminent engineer in the employ of Russia, has already spent several months in the United States, but is now planning to remain in California for the winter before returning to St. Petersburg. In published interviews he states that southern provinces of Russia are now under irrigation, but that within the past decade there has been no especial interest or advancement in the methods of reclaiming arid lands. The congestion of population in many of the large cities of Russia now demands solution and the government has delegated Mr. Skorniakoff to make recommendations looking to the storage and distribution of water over great tracts in southern and middle provinces of Russia.

Tsuneo Tokumi, Japanese engineer stationed at Formosa, is now making a trip through the south, securing information as to methods of drainage to reclaim swamp lands. In connection with his visit he states that his government projects an immense drainage system for Formosa, involving the expenditure of nearly \$15,000,000 for the reclamation of about 300,000 acres



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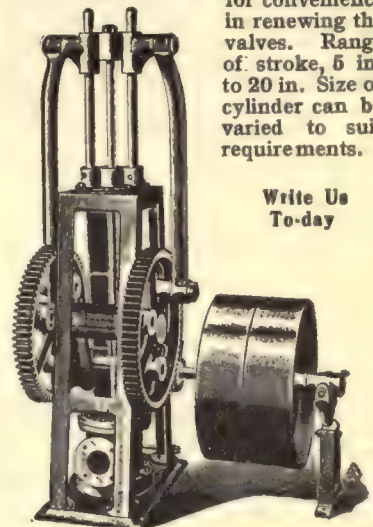
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of rice and sugar lands located on this island. He states that aside from his work in connection with drainage matters, he will make an exhaustive study of irrigation methods and that upon his return to Japan will present a report on reclamation of swamp and arid lands.

"WINTON SIX."

Alexander Winton, Discussing Automobiles, Says Six-Cylinder Will Be Standard Type for Many Years.

Does the six-cylinder car mark the last radical improvement of the automobile?

Alexander Winton, president of the company that bears his name and the only big manufacturer in America who produces sixes exclusively, believes it does.

"Of course," says Mr. Winton, "no sensible man pretends to forecast the future absolutely, but it does not seem possible that a car superior to the six will be made, at least within many years. Certainly no development is yet in sight. Advocates of simplicity look with hope toward the two-cycle motor, and yet, though endless and fortune-wasting attempts have been made to put this form of motor to the front, there is but one maker in America who has been able to get a single annual dividend from it.

"There are those who have a lingering hope that the future may produce a successful gasoline turbine, but there is no present foundation upon which that hope may rest.

"An American inventor has lately made a stir abroad with a valveless four-cylinder motor, in which two slotted sleeves, moving between the piston and the cylinder walls, provide inlet and exhaust ports. The moving parts of this construction are as numerous as in a motor of usual four-cycle construction, and, added complication, seems to produce only the absence of valve noise, which, reasonably, might be more easily eradicated. The significant fact, however, is that the British company which took up the manufacture of the valveless engine, displayed at the Olympia show, a six-cylinder car, the first it ever produced, so that we can only conclude that even this most highly developed four-cylinder car still lacks a much desired something that the six supplies.

"We hear less now than ever before of the 'added complication' of the six, of the terrors of ignition, carburetion and the valve timing of the six. Present silence may well be taken to mean that views have changed. More manufacturers have entered the six field, which in part accounts for the silence. But the maker who produces both fours and sixes cannot very earnestly advocate either type, so that from such men we need not expect startling views either way.

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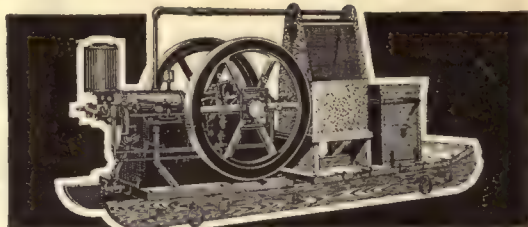
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This powerful little engine will pump unlimited quantities of water for you at a surprisingly small cost.

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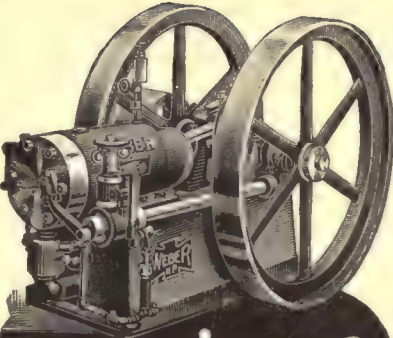
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IF YOUR LAND has not been brought to a grade that will let water flow over it by gravity alone, you need one of our Shuart Graders.

The Little Yankee is a ditcher. Not only is it that, but it is a digger, leveler, grader, all in one. Special attachments shown in our catalog. Fresno, wheel, drag and ditch scrapers, plows, and in fact everything for irrigation grading.

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Irrigation in Victoria

By
ELWOOD MEAD, M. Am., C. E., M. Inst., C. E.,
Chairman State Rivers and Water Supply Com-
mission.

In the Engineering Record of January 20, 1909, appeared an article on "Irrigation in Victoria," which described the difficulties which irrigation development had encountered, and contained near its close the following sentence:

"From the terms of the water act referred to, and from the discussions which took place in the Victorian parliament regarding it, the inference which may fairly be drawn is that from the general taxpayer's point of view the irrigation works must be regarded as a permanent and hopeless failure."

It is true that the state as a whole pays a considerable interest on sums spent on irrigation development. Part of this is on sums written off an indebtedness of irrigation trusts several years ago, and part interest on works which were built as free headworks, and on which it was announced at the outset no interest would be charged. But last year the completed state works instead of being a hopeless failure from the taxpayer's standpoint paid 4 per cent interest on the existing capital debt, and met all operating expenses and current repairs. And they would have done equally well this year had it not been for a large sum spent on extensions and betterments which have not yet become revenue producing. When the water which this makes available comes into use there is every reason to believe that the entire irrigation system will pay 4 per cent interest on the reduced capital debt and provide a satisfactory sinking fund for the ultimate extinguishment of that debt. And as the state is able to borrow money at $3\frac{1}{2}$ per cent interest the taxpayer is not likely to suffer.

The real cause of the financial losses incurred in the earlier years of Victorian irrigation development are not disclosed in the article referred to. They were agricultural rather than engineering. When the first works were built the irrigable lands were practically all in private ownership. The farms were large, and irrigation was not a matter of necessity, as the rainfall is sufficient to grow large crops of grain. The landowners had neither the labor nor the inclination to adopt the methods of cultivation necessary to success in irrigation. What they did was to secure from the state a costly and extended system of channels planned to supply water to only a few acres of each farm, which was used chiefly to grow fodder crops to supply green food for live stock during a brief period in summer, when the pastures were dried up. It was found that channels built to carry water past four or five acres of unirrigated territory to supply one acre of irrigated land were costly to build and still more costly to operate. And it was discovered that when water was applied to land not properly prepared the results were unsatisfactory.

That irrigation works built on this plan would not pay is now apparent to all who understand the requirements of irrigation. But the difficulty of inducing the landowners to change their methods before the value of irrigation had been proved led at the outset to this makeshift substitute.

That experience and its consequences belong to the

past, and the losses were no greater than America incurred during the early years of canal building. The works now being built and those being reconstructed are intended to provide for the complete irrigation of all the land, and wherever the holdings are too large for successful results the state is acquiring the land and subdividing it and offering it for sale in small areas. The works now nearing completion will provide water for 250,000 additional acres, and this will open up opportunities for home seekers not surpassed in any country of which I have any knowledge.

The reason for this lies in the combination of natural advantages which irrigated agriculture possesses. The climate of Victoria is very like that of California, and the Goulburn Valley, where the chief development is taking place, resembles in many ways the Sacramento Valley in California.

Practically all of the 250,000 acres which will soon be provided with water for irrigation is suited to fruit growing; pears, apples, oranges, lemons, raisin, wine and table grapes are being profitably grown on contiguous irrigated areas. A great shipping trade has already been established in apples and pears, which are carried from here directly to the markets of Europe. Experiments are now being made in the shipping to London of table grapes and promise to be successful, and in supplying Europe Australia will have great advantages over the Pacific slopes of the United States, because its fruits come at the off season and because the expenditure in railway freights in order to reach the ocean is far less. The greatest possibilities of irrigation in Victoria are not, however, in fruit growing, but in supplying hay and fodder to carry live stock through the dry months of summer, especially in years when lack of rain is long continued. A few geographic facts will make this apparent. The continent of Australia has an area equal to the whole of the United States; three-fourths of this is semi-arid, well suited to pastoral industries, but unsuited to the growing of other crops except small grain. It has, however, great advantages for growing live stock owing to the mild climate in which winter is unknown and to the abundance of nutritive grasses, which grow luxuriantly during the spring and autumn months. The conditions are very like what they would be in America if all the live stock grown in the Mississippi valley had to depend for its winter food supply on the hay crops grown in the arid regions.

Hay is one of the best paying crops in arid America even when subjected to the competition of the humid and fertile interior valley drained by the Mississippi and its tributaries. But its possibilities are meager when compared to the opportunity opening up to the farmer under irrigation here. Where wool grown in the interior sells for about double that grown in America, where the export trade in refrigerated meat is rapidly extending, and where the dairy trade only waits to be released from the vicissitudes of dry seasons to take a front rank in European markets. The extension of irrigation will accomplish this and will give to the Victorian alfalfa grown, the market which in America is supplied by the growth of both corn and hay. As a result of this extended and constantly increasing demand the prices paid for alfalfa hay, grown chiefly under irrigation, seemed at first incredible. I found on my arrival in November, 1907, that £5 per ton was being paid for loose alfalfa hay in the field where cut, and this price rose before the end of the season to

£8 per ton when pressed for shipment. Pressed hay is selling in Melbourne at present for £5 per ton.

From four to six cuttings can be made each season in the irrigated areas. The consequence is that in those districts where the land is properly graded and cultivated land values have reached high prices, £100 being paid in some instances for alfalfa farms. The improved farms which the state recently purchased for subdivision were resold to settlers at prices varying from £8 to £16 an acre, and this will probably be the range of prices on the large area soon to be opened for settlement. Thirty-two years' time is given to pay this, with interest at 4½ per cent, the first payment being 3 per cent of the purchase price.

Under the Small Holdings and Closer Settlement acts the state is preparing to aid in the settlement and development of its irrigable areas in the following ways:

1. Long time and low interest in paying for land.
2. No charges for water rights, only an annual charge to meet interest and operating expenses. The average price of water will be 5/— an acre foot, measured at the place of use.
3. Small advances to settlers to aid in constructing needed buildings.
4. State cool stores, to which meats, fruits and dairy products can be consigned. Thus relieving farmers of the discrimination and extortion sometimes charged against American farmers by meat and dairy trusts.

These advantages, coupled with the high prices of farm products, are making the irrigated districts so prosperous that the old water troubles are being forgotten. With an annual charge of 10/6 an acre for water the state irrigation works will be a complete financial success, and at this price water is cheap whether considered in respect to the results it makes possible or compared to prices under similar works in America.

I know of no country where the profits of irrigated agriculture promise to be greater or where the ultimate success of all the irrigation works, whether considered from an agricultural or financial standpoint, are better assured than here. Victoria has one enormous advantage over the United States, it has taken the question of water rights or the control of rivers out of the domain of speculation or the uncertain jugglery of courts. Instead of water titles being determined as in America in suits at law between private claimants in which the public has no adequate voice, all such matters are settled by administration procedure. Riparian rights have been eliminated by the simple and effective method of the state retaining ownership of a strip of land bordering each side of every stream, hence the state is the only riparian proprietor; no one can cut the bank or build a pumping plant, or in any way interfere with the water supply of a river or creek without trespassing on state land and obtaining the state's consent thereto. The contrast to this presented by the enormous and constantly increasing litigation over water rights in America is one which can only be fully appreciated by one acquainted with conditions in both countries and who knows how heavy is the burden in money, cost, and worry imposed by the continued warfare in the courts due to lack of proper public control of streams. There has not been a law suit over water titles in Victoria for ten years, and there are no indications of any being instituted within the next ten years.

Irrigation under these conditions should pay, and there is no question in the minds of those who understand conditions best, that the state works for providing water are destined to be a complete financial success.

COMMENT AND CRITICISM

HOW MAXWELL RAISES MONEY.

The National Irrigation Congress which met this year in Spokane should not be confused with "The National Irrigation Association," a concern that is run chiefly, if not wholly, by George H. Maxwell, who publishes a monthly called Maxwell's Talisman. Probably a great many people have contributed to Maxwell's scheme under the impression that they were aiding the National Irrigation Congress.

Maxwell was closely questioned by the house committee on irrigation of arid lands and admitted that his scheme was subsidized regularly by the transcontinental railroads to the extent of \$39,000 a year; that other contributions brought the annual receipts to about \$50,000 a year, and that he practically controlled the expenditure of this great sum.

At the hearing Chairman Hitchcock of the committee expressed a belief that Maxwell's periodicals which pretended to champion the interests of the people were in reality zealous advocates of railroad interests, when those interests came in conflict with the people's rights. Chairman Hitchcock asked: "Is it not true that your association has taken occasion to ridicule legislation prohibiting the location of valuable timber lands with the forest reserve lieu rights or script (held by the railroads) and the people who have proposed it?"

Maxwell answered this and other questions evasively.

Maxwell is now sending circulars broadcast to the business men of the United States, urging them to contribute to his "National Irrigation Association" and two other schemes of his devising—the American Homeroft Society and the Rural Settlements Association. He signs himself "executive chairman," but in his circulars fails to give any names other than his own in connection with the Homeroft society and the Rural Settlements Association.

It is believed by persons who have investigated Maxwell's operations that he has been in receipt, for several years, of a total fund of about \$100,000 a year, of which he has absolute control and disposition.

Prudent business men will want a more definite and substantial guarantee of the proper and business-like expenditure of these various funds before they contribute to Mr. Maxwell.—Spokane Review.

ATTACKS PINCHOT PLAN.

United States Judge Cornelius Hanford, in addressing a meeting in the Exposition Auditorium at Seattle recently, denounced the conservation policy advocated by Chief Forester Gifford Pinchot and former Governor Pardee of California, saying:

"We have been told repeatedly by advocates of the 'big stick policy' that our court's proposed new system will not hurt the West, but will aid in the development of the natural resources of the region in which vast areas are reserved and to be reserved. These provisions of kindly intentions bring to mind a case tried in one of our courts many years ago, in which, according to the testimony, a murderer consoled his victim by beseeching him not to mind having his throat cut, because the pain would soon be over, and he would be in heaven.

"In our state the reservations comprise more than 27 per cent of its total area, into which no homeseeker dares to set his foot. The water runs down our mountains, and most of it flows idly to the sea, without turning a wheel, but to prevent grabbers from acquiring vested rights the theorists insist it must keep on flowing idly until it can be made to yield tribute to the national treasury perpetually as the agents of the government shall dictate."

Jerks and Repair Bills vs. Continuous

THE single-cylinder motor car jerks itself along. You can almost see each separate jerk. The four-cylinder car differs from the single-cylinder chiefly in that it has four times as many jerks. Perhaps you never thought of it in just that way—but it's an absolute fact.

Jerks are the worst enemy of motoring. Jerks eat up tires, devour gasoline and oil, and shake your car into the repair shop.

All makers know that.

Some of them have acknowledged it by using heavy flywheels.

But heavy flywheels only lessen the shock of each jerk and do not cure the jerk itself.

Like giving the baby a sleeping opiate (so he'll not feel the pain) without doing one solitary thing to remove the cause of the pain.

Jerks in a motor car are due to the power-strokes of the piston.

The carpenter comes and tears out every fifth step.

That leaves four steps and a gap, four more steps and a gap, four more steps and another gap.

In climbing those stairs, you have to jump every fifth step, don't you?

That's practically what every four-cylinder motor has to do driving its car.

For every four-cylinder motor produces power only **four-fifths** the time and has to jump the one-fifth gap before it produces power again.

And it makes absolutely no difference how fast the motor turns over, or how many flywheels it may have.

Six-cylinder motors produce power **six-fifths** the time.

Thus in the Six, power in each cylinder always **overlaps** power in each preceding cylinder one-fifth the time.

The result is **Continuous Power**.

The Six produces more than enough power to fill the gap.

So, there is never an instant of "no power" in the Six.

And there is **never a jerk** in the Six, because there is no gap.

A 48 horse-power, single-cylinder car jerks itself along under 28,800 pound power-strokes—28,800 pound jerks.

A 48 horse-power, four-cylinder car jerks along under four times as many jerks, each jerk having 7200 pounds behind it—7200 pound jerks.

But the Six-Cylinder car (no matter how great its horse-power) doesn't jerk at all, because it has **Continuous Power**.

Mark this: The Six is the only gasoline car that has **Continuous Power**.

No motor car can have Continuous Power unless it has **Six Cylinders**.

Continuous Power and Six Cylinders are inseparable.

At home you have a flight of stairs.

If all the steps were replaced, you could ascend and descend your stairs without acrobatics.

So, if a motor could only produce power all the time, it wouldn't be necessary to resort to futile flywheel acrobatics.

And as your acrobatics do not replace the missing steps, so neither do flywheel acrobatics supply the missing power.

One-cylinder motors produce power **one-fifth** the time.

Four-cylinder motors produce power **four-fifths** the time.

Because it has a stream of **Continuous Power**, without ever a jerk, the **Six** is the smoothest, sweetest-running motor in the world.

Continuous Power saves tires and repair bills. Twenty Winton Sixes traveled 184,190 miles (more than seven times around the earth) on total repair expenses of \$142.43.

That averages 77 cents per 1000 miles.

What was your average, Mr. Owner, on jerky power?

Continuous Power does more work than jerky power. That's why the Six motor will drive its car, on high gear, at a motor speed so slow that, if attempted on a four, the motor would stall.

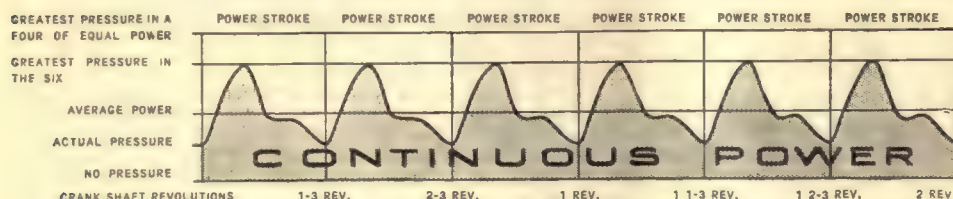
Since the Six motor will do this, the higher speeds of the Six motor represent **Reserve Power**.

This **Reserve Power** makes the Six the best hill-climber there is.

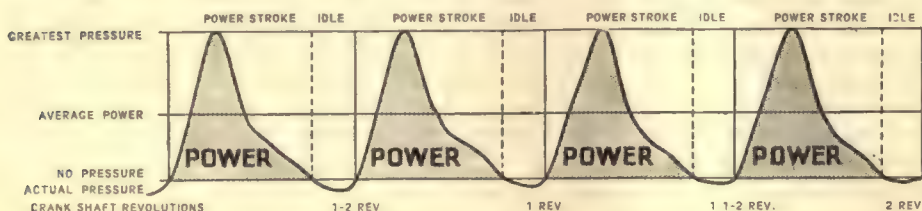
Ability to run on high gear at extremely slow motor-speed, reduces the necessity of gear-shifting in traffic and on hills. That means **Flexibility**.

Flexibility means **Economy**. Everybody knows the economy of continuous use of the high gear, and the wastefulness of low gears.

The Application of Power in the Six-Cylinder Motor



The Application of Power in the Four-Cylinder Motor



When writing to advertisers please mention The Irrigation Age.

Power

Continuous Power enables a car to "pick up" and get away faster than is possible with jerky power. The Six gets through crowded traffic at a great saving of time and patience.

See the Power Diagram.

Note the four-cylinder gaps of **No Power**. (Marked "Idle.")

Note the **continuous, unbroken power-stream** of the Six.

That's the chief reason why there are Six-Cylinder cars on the market.

The Six remedies fundamental faults of all previous types.

Because that is true, the Winton Company is now making **Sixes exclusively** for the **third successive season**.

It is a matter of conscience with us. We haven't the hardihood to make an outclassed type of car.

Six-Cylinder Advantages ought to apply to all Sixes—because the differences are fundamental and reach back to basic principles.

But since some makers now producing sixes, continue to make old-style types also, we can only conclude that their sixes have not convinced them—the makers.

If a maker isn't himself convinced by his own product, he is, to say the least, ill-equipped to convince you.

So we suggest that you look for Six Superiority in the Winton Six, the car that is able to show that Superiority.

Furthermore, there are numerous exclusive advantages in owning a Winton Six.

The Winton Six motor starts from the seat **without cranking**. This feature, not found on any other car of any other make, is a feature worth the price of one's self-respect.

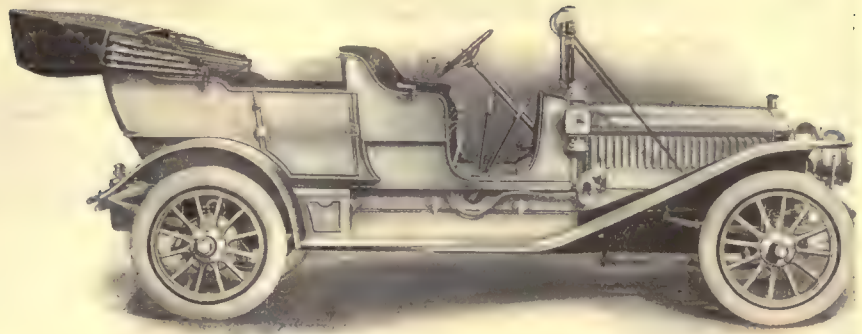
The same pressure that cranks the motor also inflates your tires.

The Winton Six motor for 1910 is identically the same motor we used for 1909. **It needed no improvement.**

The Winton Six motor is completely housed—not a single working part exposed to dust and dirt. No wonder Winton Six motors seem to run forever without trouble.

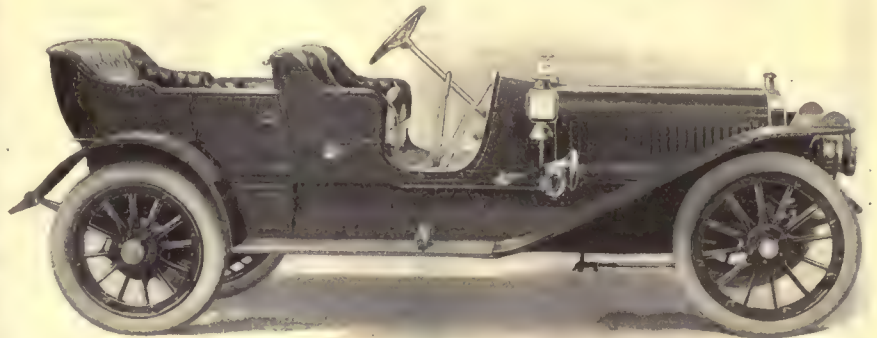
The 1910 Winton Six buyer gets four forward speeds, a large diameter multiple-disc clutch, the best carburetor we have ever seen, dual ignition, a superb, roomy body, suspended low on semi-elliptical springs, 124-inch wheel-base (four inches more than last year), and an inswept frame, allowing short turning radius.

At \$3000, the 48 horse-power Winton Six for 1910 represents the absolute limit of motor car value.



This is the self-cranking, 48 horse-power Winton Six Touring Car—\$3000.

The upper car seats five passengers, and the lower car four passengers. Except in body, they are identical. Six-cylinder, 48 h. p. motor. Cylinders offset. All working parts housed. Oil-bathed multiple-disc clutch. Four-speed, selective transmission clutch and transmission run on ball-bearings. Bosch or Eisemann magneto, and storage battery. The liveliest carburetor we have ever seen. Force-feed lubrication. Frame narrowed in front, to allow short turning radius. 124-inch wheel base. Semi-elliptical springs, with four shock-absorbers and four rubber bumpers. 34-inch wheels. 4-inch tires in front, 4½-inch tires on rear wheels. Low-suspended body. Price, with four or five-passenger touring car body, runabout body, or toy tonneau body, \$3,000. With limousine body, \$4,250. With Landaulet body, \$4,500. Chassis only, \$2,750.



WINTON SIX

The Car that Traveled 184,190 miles on \$142.43 upkeep—averaging 77 cents per thousand miles.

When Price Does Not Mean Value

Car buyers pay every expense of the car manufacturer. Every expense—legitimate and otherwise.

The car buyer pays the maker's bills for material, pays his payroll, his selling commissions, taxes, insurance, freight, rent, coal bills—everything.

Because every expense of the maker is figured in the price of the car—the price the buyer pays.

The maker who is extravagant, wasteful, a poor business man, is compelled to **charge more** for his car than is the careful and competent maker.

The maker's extravagance and mismanagement add to the price—but do not help the car's quality.

Remember that. . . .

The extravagant, wasteful maker bluffs his high prices upon buyers who are **not careful** to ask what they get for their money—

Or who think that high price must mean high quality.

Price and quality are widely different things.

Careful buyers know that already.

Careful buyers get **maximum car-merit** without paying for a maker's racing team, publicity stunts, red-tape and watered stock.

Careful buyers first **analyze cars** and then **compare prices**.

That's the way to get your money's worth.

There is no mystery about motor cars. Any clear-headed man can determine a car's real worth by comparison.

For instance:—

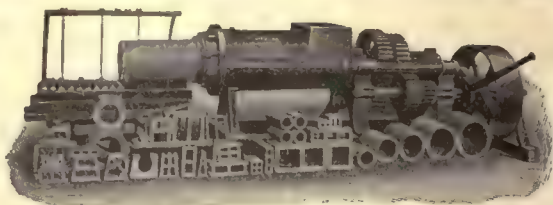
Compare power. A 48 horse-power car is worth more than a 30 horse-power car.

Compare motors. A six is worth more than a four. A motor with working parts fully housed is worth more than one with working parts exposed.

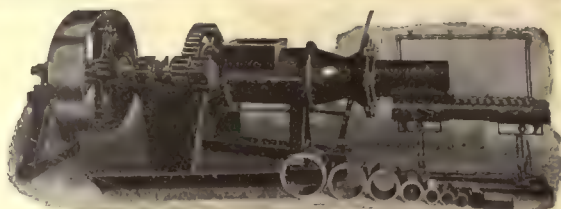
Compare clutches. An oil-bathed multiple-disc clutch is worth more than any other clutch.

(CONTINUED ON PAGE 70)

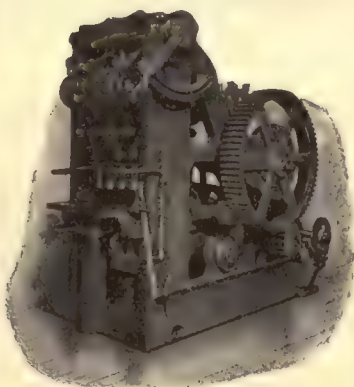
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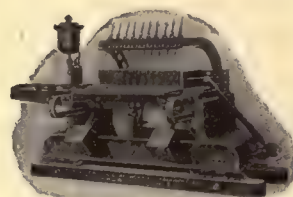
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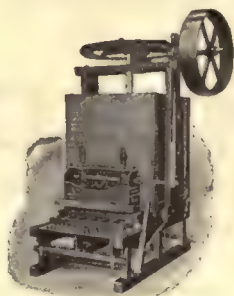
"BUILT RIGHT—
RUN RIGHT"

We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

The American Clay
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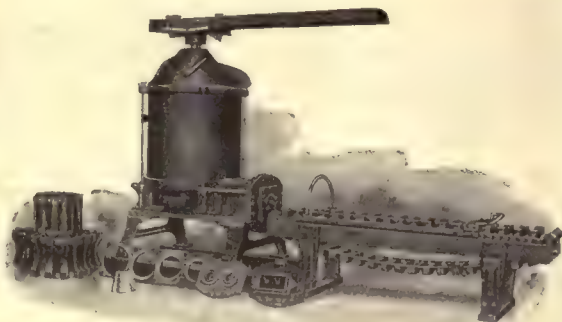
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Products of our Auger Machines

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VERY RICH ALLUVIAL LAND**100,000 Acres****\$2.00 Per Acre****Near New Orleans City, Railroads and River****Soil**

THE SOIL FROM THIS LAND IS WORTH \$6.50 PER TON AS A FERTILIZER. The land is low, level prairie, covered with a heavy growth of grass, and produces under cultivation from \$50 to \$125 per acre net upon staple crops, and from \$250 to \$1,000 per acre upon early vegetables and oranges.

13,000 AND 8,000 ACRES \$2.50 PER ACRE, situated upon a deep and navigable stream, so that a farmer could harvest his crops in the afternoon and have them in the New Orleans market and the surrounding cities in the morning.

Climate

One of the healthiest cities in the Union. Average resident white death rate less than fifteen per 1,000.

Temperature

The temperature in winter seldom below 30 degrees, and usually between 50 and 60 degrees Fah. In summer between 75 and 90 degrees Fah.

Has the Largest Sugar Refinery in the World
15,000 Barrels Refined Sugar Daily

The building of the Panama Canal. New Orleans is destined to have over 1,000,000 population within the next few years.

The city is expending \$25,000,000 for sewerage, drainage and municipally owned water works and filtration plant.

Does not tax foreign capital.

ALLUVIAL LANDS CO.**121 La Salle Street,****-****CHICAGO, ILL.**

55,000 ACRES OF Colorado Irrigated Land

AT DENVER'S DOOR

Under the Antero Reservoir and High Line Canal

Farmers and investors who are considering the buying of low priced lands near a good city with

**More than enough
Water for
Irrigation**

cannot find a better buy [than to] secure land now which will be irrigated by The Antero Reservoir and High Line Canal. This land, lying at Denver's door, ready for the farmer, can be bought at prices that will more than double in the next year. Come and see this land at once.



Denver has a population of 225,000 to feed. If you want land and consider

**Good Markets,
Location,
Climate and Crops**

as an asset in buying land, this is your opportunity to get them all. The soil is ideal, will grow large crops, and is being bought by farmers and investors of Colorado and the Middle West who know good land when they see it. When under cultivation this land will be worth from \$300 to \$500 per acre.

THE HIGH LINE CANAL IN PLATTE CANON

The BEST BUY in COLORADO for FARMERS and INVESTORS

Thousands of land buyers are commencing to realize that Colorado irrigated land is the best investment that they can make. More irrigated land, and land coming under irrigation, has been sold in Colorado during the past year than ever before in the history of the State. The land coming under the Antero Reservoir and High Line Canal is near enough to Denver to haul in the crops you raise to sell to the Denver market. The time you take to investigate this land and water system will be well spent. We want you to

Come to Denver and See this Land, or Write for FREE BOOKLET and Particulars

to any of the following prominent real estate firms, who will take you in an automobile from Denver and show you the lands in the Antero District. Write any of them today:

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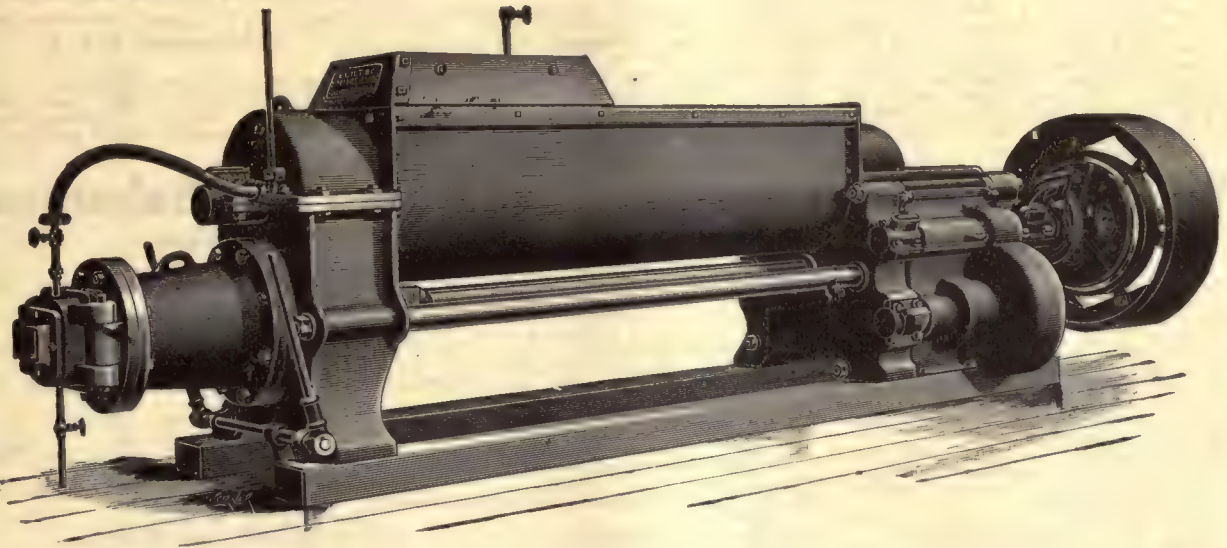
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If interested write us for particulars and estimates.

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WINTON SIX

(CONTINUED FROM PAGE 65.)

Compare **transmissions**. The selective type is worth more than the progressive type. Four speeds are worth more than three.

Compare **conveniences**. A self-cranking car is worth more than one that requires cranking.

Compare **operation**. Quietness is worth more than noise. Flexibility is worth more than inflexibility. Hill-climbing capacity is worth so much that you can't afford to lack it. Comfort (always try the rear seats) is priceless; an uncomfortable car is a white elephant on your hands.

Compare **types**. Is it an un-to-date Six or an out-of-date type?

Compare **"previous performances"**. Has the car stood up in the past, or is it a new-comer without a pedigree? * * *

Just make these comparisons, and then—compare prices. Having found that the sweet-running, six-cylinder Winton Six possesses every desirable element a motor car can have, you will note that its price of \$3000 is less than the price of every other quality car on the market.

The Winton Six price is lower because: There is no water in Winton stock. (Incidentally, there is no Winton stock for sale.)

There are no Winton mortgages or bonds with interest charges to force up the price.

We make the Winton Six in our own plant, eliminating intermediate expense.

The Winton plant is conducted in the most economical manner consistent with high-class results.

There is no extravagance in Winton management—no army of time-serving clerks, no load of unproductive labor, nor red tape.

We do not give 30 or 40 per cent commission on sales.

Being America's longest-established successful makers, we know how to produce maximum car-merit; and knowing that it pays in the long run, we give our purchasers the benefit of our economies in production and selling.

That's why the six-cylinder, 48 horsepower Winton Six at \$3000 represents the absolute limit of motor car value.

We want you to make us prove this statement.

Because, in proving it, we'll make you as enthusiastic over the Winton Six as we are.

Our catalog is the most complete and thorough ever issued by an automobile manufacturer.

"Light Weight" is a subject we handle without gloves.

"The Difference Between Price and Value" analyzes the worth of cars.

Write us today.

THE WINTON MOTOR CARRIAGE CO.

Member A. L. A. M. Licensed Under Selden Patent.
CLEVELAND, U. S. A.

Winton Branch Houses (owned and operated by the Company) in New York, Boston, Philadelphia, Baltimore, Pittsburg, Detroit, Chicago, Minneapolis, Seattle and San Francisco.

The 1910 Winton Six Is on Display at These Salesrooms

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BALTIMORE—209 North Liberty Street. W. L. Duck, Manager.
PITTSBURG—Baum and Beatty Streets. Earl H. Kiser, Manager.
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San Antonio, Texas—C. H. Dean, 234 South Flores Street.
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ARTESIAN WATER

has been discovered in southern Nevada, on the main line of the San Pedro, Los Angeles & Salt Lake R. R., only a few hours' ride from Los Angeles, California.

On October 10th a well was brought in, flowing 120 miner's inches at a depth of only 325 feet.

The soil is the very richest, producing pears, apples, figs, alfalfa (alfalfa returns over \$100 per acre) and all kinds of vegetables. One man received over \$1,000 from one acre of vegetables!

There are 15 flowing wells; over 7,000 acres of land have been taken up since the first of October. A syndicate of wealthy mining men from Tonopah have taken up 3,000 acres and are preparing to irrigate it and sell it to settlers. All this land is within eight miles of Las Vegas, the coming town of Nevada. Five years ago Las Vegas existed only on the map, and what is now a thriving town was only sagebrush. Today, there is a population of 1,800, macadamized streets, electric lights, telephone, a fine hotel, The Nevada, equipped with all modern improvements; the railroad is expending one million dollars in machine shops; the Pacific Fruit Express Co. have built a new Ice Plant costing \$250,000; 125 cottage houses are being built for the skilled laborers who will come to work in the railroad shops. Las Vegas is the supply point for the great mining sections of Tonopah and Goldfield.

We can sell you lands from \$15 to \$100 per acre, which will more than double in value within the next twelve months. Write NOW for particulars. Tell us what money you have to invest and we will give you reliable advice. We furnish bank references.

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We are the Largest Dealers in Land in Southern Nevada

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Pump 150 feet long. Capacity 450 gallons per minute



We manufacture Double Acting Deep Well Pumps that pump a continuous stream from well and deliver it either at the surface or through long pipe lines *against high heads above the surface* at one lift. Write

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Going Up!

City ways were not altogether new to him, but, as he waited at the elevator shaft, in one of the large office buildings, he said to his companion:

"Well, I'll be hanged if that isn't a beater."

"Why, what?"

"Just look at that confounded railroad advertising on an elevator—UP! What won't they do next?"

His companion replied, "Sh, Sh, those letters mean 'up.' When I see that word, this jingle always comes to my mind:

**'Whenever the little word "up" you see,
Think of Safety, Speed, Service, via U. P.'"**

You will see that word at almost every passenger elevator in the country—but, before you leave for the West, be sure to ask for literature and information relative to rates, routes, etc.

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E. L. LOMAX, G. P. A.
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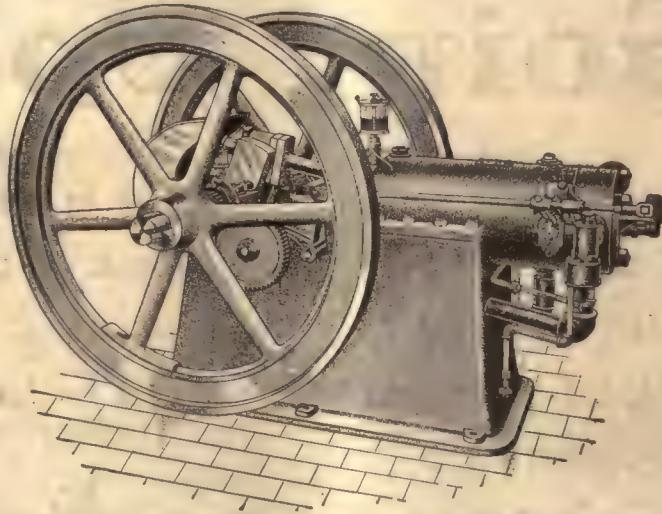
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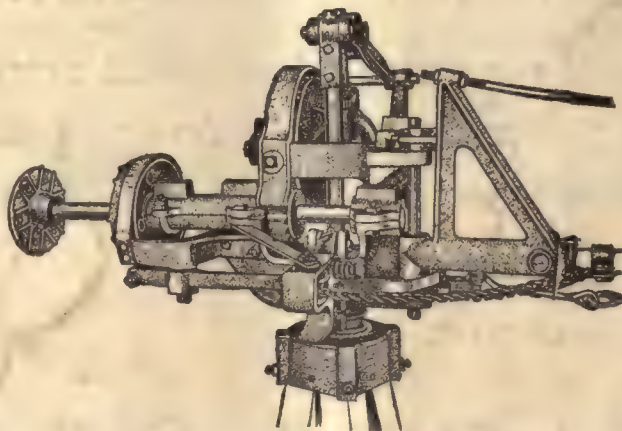
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THE IRRIGATION AGE

VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO. 2

CHICAGO, DECEMBER, 1909

THE FINISHED APPEARANCE OF THE DITCH



is the first thing that strikes the observer of work done by an AUSTIN DRAINAGE EXCAVATOR. If the observer be a contractor, he will see more than mere good looks. He sees

1. A ditch dug and finished simultaneously at the same unit cost.
2. No excess excavation—only so much material as the plans call for is removed.
3. A machine which will dig a drainage canal through a swamp or an irrigation canal across a desert.
4. If he will look up cost records, a machine which will take out material and deposit it in spoil banks more cheaply than it can be done by any other machine used in ditching.
5. A canal that pleases the engineer and adds to that asset of his business called "good will."

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OR LEASE

The Austin Drainage Excavator
The Austin Levee Builder
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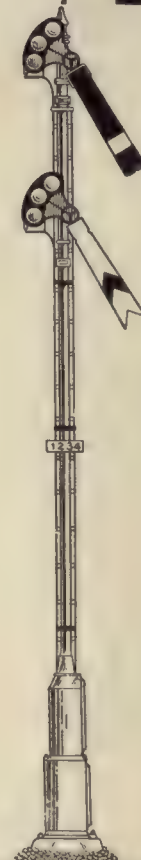
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Manufacturers of all kinds of Hand and Windmill Pumps

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Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

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QUESTIONS 7 to 13 ANSWERED

ABOUT THAT

6-PURPOSE IRRIGATION MACHINE

Go to the Land Show in Chicago? It's over, but what a memory! Such active interest was displayed by every class of persons from the Colored Pullman Porter to the Landed Proprietor of foreign blood.

Questions? Yes. All practical. Many of them centered along machinery for cutting sage brush—for leveling and sloping land—for cutting wide and narrow ditches—for throwing borders.

The Baker Mfg. Co., No. 726 Fisher Bldg., will answer some of these questions. If you have others, write direct to them. They will be answered by mail without charge.

No. 7—Size of Laterals.

Question—What sized laterals will the 20th Century Ditcher cut?

*Answer—*The pitch of the blade can be regulated to cut a narrow or wide ditch. The narrow ditches measure:

- 12 in. deep x 24 in. wide.
- 16 in. deep x 30 in. wide.
- 18 in. deep x 36 in. wide.
- 24 in. deep x 48 in. wide.

Wider and deeper ditches can be cut as demand requires.

No. 8—A Little Mysterious.

Question—What do you mean by the expression, "6-purpose machine"?

*Answer—*That machine—the 20th Century—is a Ditcher, Leveler, Sage-brush Grubber, Road Grader, Shallow Drain Maker and Border Thrower; all six combined in one easy-to-buy, easy-to-handle machine for economical irrigation farmers.

No. 9—Shape of Ditches Vital.

Question—Does it matter what shape the side of a ditch is?

*Answer—*Yes, indeed. Round-bottom ditches always fill up rapidly. They are loose on the bottom—they are not easily cleaned. The hard bottomed "V" shaped ditch is the ideal form. Water runs rapidly through it; it does not fill easily with washed dirt; the sides do not fall in as in the round-shaped form. The 20th Century Ditcher cuts a ditch with an

angle of 45 degrees at the side—a pitch which supports the side dirt and helps resist the breakdown swash of the rapidly-moving water. (See cut No. 1.)

No. 10—Firm-Bottom Ditch.

Question—One party said at the Land Show at Chicago that when the 20th Century made a ditch, one of the horses walked in the ditch and that one wheel followed the point of the blade. Is this tramping and wheel pressure of any advantage?

*Answer—*Yes. As shown by the half-tone on this page, the horse precedes the Ditcher, making the "V" point firmer than it would be if the weight of the horse had not gone over it.

Then the three-inch, flat rim of the wheel of the 20th Century following the point of the blade at a 45-degree angle, helps to roll down the side of the angle and make the point still sharper. Anyone is safe in ordering a 20th Century. It will cut just the laterals any irrigation farmer may require.

No. 11—Cost of Grubbing Brush.

Question—Is there no cheap, easy way to get rid of sage brush? It's dreadfully slow to hack out each plant with a mattock. It costs \$3.00 to \$4.00 per acre. What do you think of the bent rail?

*Answer—*The bent rail is dragged backwards and forwards over the brush with a team at each end. This is a little more satisfactory than digging out each plant by itself. But the rail leaves much standing which has to be dug out finally. This costs about \$3.00 an acre.

The cheapest method is to fasten the 20th Century Brush Grubber Attachment to the 20th Century Grader. Hitch on two teams. One man can easily drive. Without help he can grub from four to five acres per day. The cost will be from \$1.25 to \$1.75 an acre. This grubbing attachment slides along under the surface at a depth of from four to six inches. It slashes off the brush-roots, where the rootlets meet the thickened root stock. (See Cut No. 2.) The plow-shaped edge and the spreading knives as they move through

the soil, give it a thorough shaking up. If your ground is well sloped and level, it will be in condition for immediate sowing of alfalfa or other grains.

This plowing and grubbing combination is a great saving and means that an irrigation farmer accomplishes his plowing and grubbing in one-half to one-third of the time usually required. The cost of this separate plowing and grubbing would be from \$5.00 to \$7.00 per acre, when the same can be done with the 20th Century Combination for \$1.25 to \$1.75 per acre. Think of it.

No. 12—Leveling Land Profitably.

Question—My land has quite a few bumps and hollows. Will the 20th Century cut down these bumps and fill in the hollows?

*Answer—*If you will carefully read some of the Government Reports and Instructions to Beginners in Irrigation, you will discover that they emphasize continually the necessity of leveling and sloping the land to a proper angle from the source of the water supply. This machine is admirably adapted for cutting off the high places and carrying the dirt into the hollows. As shown in Cut No. 3, below, the blade can be set, left or right, at any acute angle or right angle. It can be raised or lowered so that the amount of dirt can be nicely gauged for either filling or scrapnig. (See Cut No. 3.)

It is impossible to give an estimate on the cost of leveling your land, but it is safe to say that it will cost at least one-half to two-thirds less with a 20th Century than by most any other method which the farmer can follow himself.

No. 13—Where to Get Information.

Question—Where can complete information regarding this machine be obtained?

*Answer—*Write the manufacturer, The Baker Mfg. Co., 726 Fisher Bldg., Chicago. "Dollars in the Ditch" is the unique name of their new irrigation folder. They send it with a complete catalog—both free.



No. 2—SAGE BRUSH CUTTER.

This has a stiff, steel cutting edge sharpened and pointed to rip open the brush. At each side are two strong, keen knives that cut a swath 30 inches wide. Is attached to 20th Century tongue. See Question 11.



No. 1—20th CENTURY CUTTING "V" SHAPED LATERAL

The loose dirt on the sides can be cut off, moved over, and leveled with the same machine. Thus no ground need be wasted. See answer to Questions 7, 9, 10.

When writing to advertisers please mention The Irrigation Age.

20th Century Grader



No. 3—MACHINE SET FOR LEVELING.

For cutting down "bumps" and hummocks, the blade is set at right angles, then lowered by main lever and a moderate slice cut off. The dirt is then spread and "spilled" as desired. See Question 12.

Myers Power Pumps

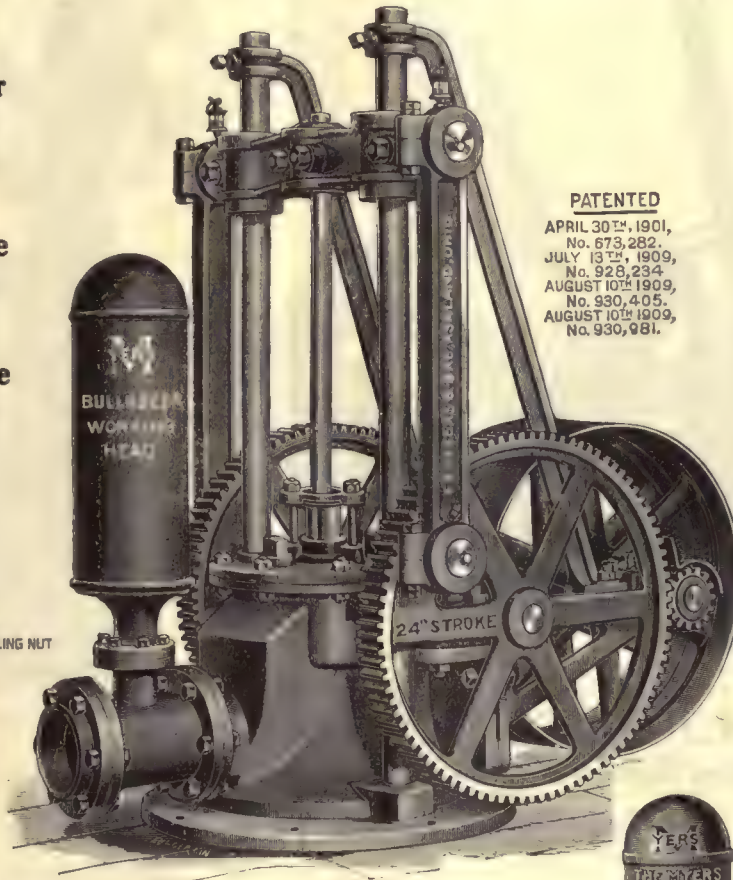
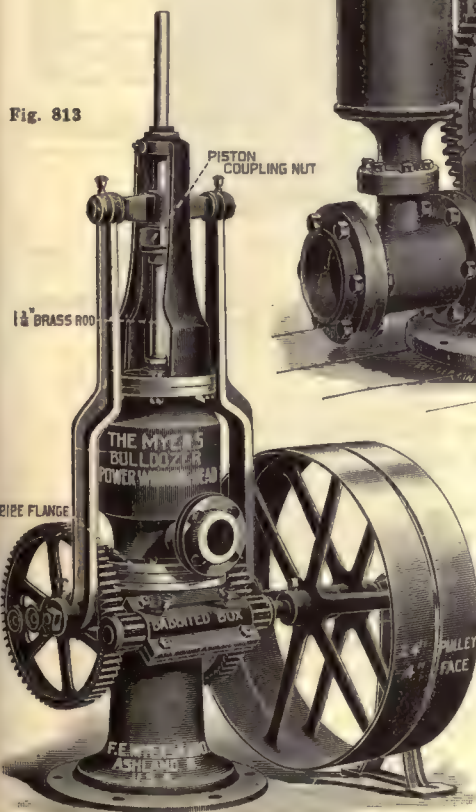
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The Myers
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For Deep Wells

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5 to 24 inches

Size of Discharge
Up to 6 inches



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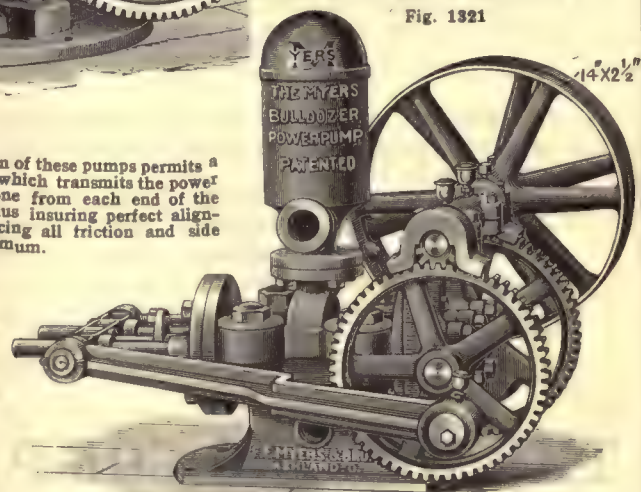
The Myers
Bulldozer
Power Pumps
For
Shallow Wells

Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
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Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

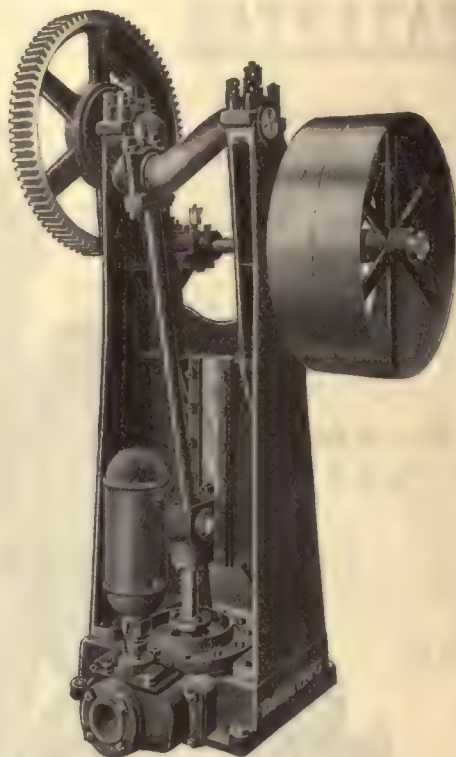
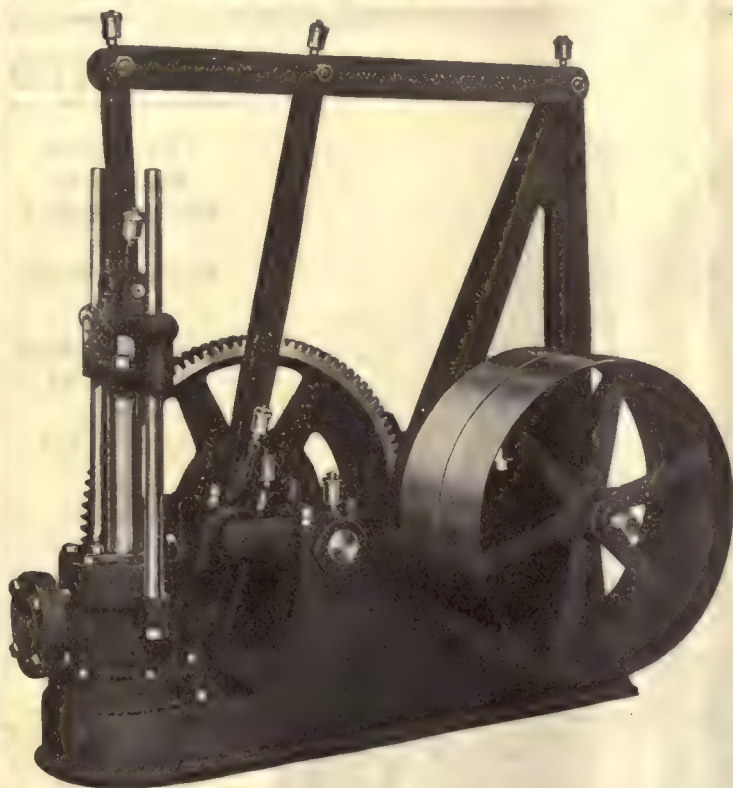
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Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

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AMERICAN PUMPING MACHINERY

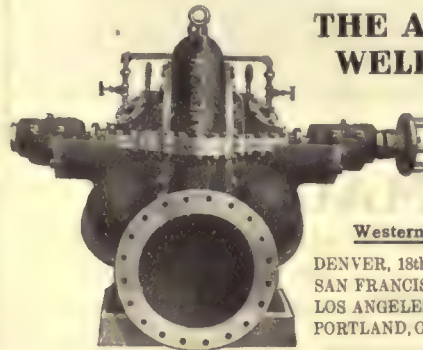
Few users of pumps realize that the efficiency of the centrifugal pump has been doubled during the last ten years and it is now the simplest, most dependable and most economical pump made.

The reason why "American" Centrifugals attain higher efficiencies than any other is, they have more refined flow-lines and there is the least possible resistance, caused by sudden change of direction and eddies of fluid when passing through the pump.

This feature enables the single stage "American" Centrifugal to attain mechanical efficiencies of 60 to 80 per cent. on total heads up to 125 feet and make them the most economical pumps for irrigation purposes.

"American" Centrifugals are made in both horizontal and vertical styles, in any number of stages, in any size and equipped with any power.

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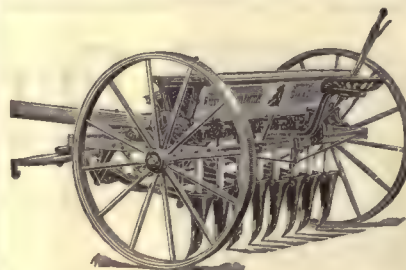
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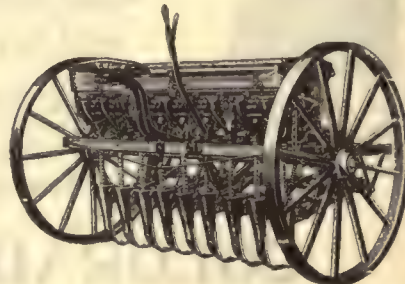
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Twenty-fifth Year

THE IRRIGATION AGE

VOL. XXV

CHICAGO, DECEMBER, 1909.

No. 2

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

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Official organ of the American Irrigation Federation.
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Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 25 years old and is the pioneer publication of its class in the world.

Although it has been freely predicted during the past two months that Secretary Ballinger would demand the removal of the chief forester for insubordination and conduct unbecoming a public official, no tangible proof of this action has yet been recorded. It is presumed that the secretary of the interior has reached the conclusion that if sufficient "rope" is given to the creator of the "water-power trust" he will accomplish his own official demise.

In his report of work accomplished by the department during the year, Secretary Ballinger points to the need for additional funds with which to complete the reclamation work undertaken by the government, but which must be carried forward slowly unless financial assistance is given. He advocates an act by Congress to authorize the issuance of bonds aggregating \$30,000,000 against the reclamation service and that these be used as needed for the completion of works in which the government is now involved.

It is probable that the secretary named a bond issue somewhat in excess of the amount desired in order that Congress may record an economy by pruning the figure to one-half or one-third the sum asked.

Whatever may be the criticisms directed against the methods employed by the Chicago Tribune, in conducting the United States Land and Irrigation Exposition in Chicago, the fact cannot be disputed that the show has exerted a powerful influence for the development of the west. Chicago, the great vortex for the activities of the middle west, and the gateway through which the east gathers much of its information concerning western deeds and doings, has been stirred to its center. Land irrigation is now a known quantity and its fruits have excited the interest of a Chicago public.

Chief among the problems before the irrigation projector today is the method by which his reclaimed areas may be populated and given proper cultivation to insure the production of food stuffs, thereby bringing return for the energy and money expended in the engineering works.

In the cities is a public that is far more frightened at the prospect of a temporary suspension of its pay envelope than at an old age of poverty and ill-health. To this class of people there is but one convincing argument—demonstration of the financial returns to be ex-

pected from the irrigated farms. In this respect the exposition has fulfilled its purpose and has opened the eyes of Chicagoans to the proven worth of irrigated lands.

While the Chicago exhibition was well patronized by citizens and was doubtless an excellent financial venture for the Chicago Tribune under whose auspices it was held, exhibitors find some reason for complaint at the lack of attendance by farmers and residents in suburban communities, recognized as being the most likely to grasp the full importance of the show.

It is but natural that THE IRRIGATION AGE should commend, along general lines, the management of an exposition that has accomplished much for the west. To the complaint as voiced by many western exhibitors against the arbitrary rulings and seeming arrogance of the managers, it must be stated, that the exposition was planned and matured by the Chicago Tribune, a commercial organization, and that too great motives of philanthropy should not therefore have been ascribed to the promoter. Neither a daily newspaper nor a monthly class journal is an eleemosynary institution—a bank account is a necessity for its operation.

Under co-operative management an exhibition of a style similar to the United States Land and Irrigation Exposition might possibly have been organized to prevent many of the criticisms and complaints so generally heard on the floor of the Coliseum.

Results from this exposition are not to be measured by either inquiry at display counters or sale of lands at the show. It was a demonstration, where the west as a whole proved the utility of irrigation methods in the production of crops. From this show large inquiry must result from those who were personally present and who have reflected upon the problem, or from those who have been interested by the statements of friends or neighbors in describing the marvelous fruits and produce seen at the Chicago irrigation exposition.

Engineers May Meet at Pueblo Congress.

There is a deal of merit in the plan advanced by Chairman McCorkle, of the Pueblo Board of Control, for a meeting of irrigation engineers in that city at the time of the eighteenth session of the National Irrigation Congress. It is to be hoped that this plan will be carried forward with vigor and that there may be formed an organization of engineers which shall meet with the congress in succeeding years.

Aside from the benefits to be gained by the members of this organization through yearly conference and exchange of ideas, their presence would add materially to the strength of the irrigation congress, for it is rarely that questions do not arise which, while interesting to practical irrigators, cannot be discussed intelligibly and

in detail except by those who are familiar with engineering lore and practice. Then, too, the financier and the projectors of irrigation works would be brought into close communication and personal acquaintance with the practical engineer. These three agents are the vital forces in private reclamation work and ties of personal friendship would aid in their co-operation for mutual benefit.

If the time taken at the seventeenth session by Forester Pinchot and his followers in a futile attempt to create a "water power trust" had been used to advantage by the presentation of an address on some practical engineering problem, the congress would have better maintained its dignity and been of more value to irrigators.

It is anticipated that state engineers from all territory west of the Mississippi river would eagerly embrace the opportunity to meet with the irrigators and exchange ideas. By properly fomenting interest in the proposed organization, Chairman McCorkle would do an excellent service for the National Irrigation Congress.

Farm Land Congress Creates Interest.

The long smoldering agitation of Ways and Means for combating the alarming tendency to herd in the cities to the detriment of the substantial and vital interests of the country, finally culminated and found expression through the medium of the Farm Land Congress, called into being through the commendable activity of the Hearst newspapers at large, and the "Chicago Examiner" in particular.

That the Congress has justified its initial purpose and its continued existence, has been sufficiently demonstrated by the generous response upon the part of all who were invited to co-operate by the initiators of the movement—a response far exceeding the most sanguine expectations of its promoters.

Delegates to the number of five hundred, from every quarter of the country, the very flower of the land, were in attendance, and without exception devoted their best thought and energies toward the solution of the many matters of detail concerned in the solution of the tremendous problems confronting them.

That the men responsible for the inauguration and successful execution of this enterprise were fully alive and equal to the situation is evidenced by the elevated character of the committees and of the list of speakers, and by the subjects assigned to them.

Resolutions often mean little, but the resolutions adopted by this Congress, composed as it was, to so large an extent, of members of law-making bodies, cannot be regarded in any other light than as the fore-runners of desired and much-needed legislation. The resolutions, as finally adopted, must appeal to the highest sense of patriotism of every student of economic affairs.

From the standpoint of THE IRRIGATION AGE,

which, for a quarter century, has in season and out of season, consistently advocated the reclamation of the arid lands of the West, it is a matter for sincere congratulation that the opportunity to secure an emphatic expression of endorsement of the work of the United States Geological Survey in its water resources investigations, and of its claim upon more substantial financial support was not overlooked, and an added source of satisfaction is the resolution calling for the means for speedy completion of the unfinished government reclamation projects with its consequent relief to be afforded settlers upon these projects now enduring hardships for lack of long-delayed water for irrigation.

Coming as it does simultaneously with the public announcement of the position taken by Secretary of the Interior Ballinger upon this vital question, it is to be hoped that the national legislators will take heed and respond to the "call of the West."

The need for further legislation authorizing co-operation between the State and Federal Governments in the construction of drainage works and the prevention of floods and forest fires is pointed out, while the establishment of agricultural high schools in each congressional district would be an unmixed blessing.

It is to be hoped that the call for a conference committee, as authorized by Mr. Walsh, will meet with the same prompt and hearty response that was accorded the call to the larger gathering. It may be well, as suggested, to strike while the iron is hot, and convoke this committee in January or February, 1910. Whether the idea of a "Central Board of Publicity" inviting, as it does, states control and co-operation, or the plan of a "centralized bureau of colonization" under Federal control will prevail, with the better chance of ultimate success, within a measurable period of time, remains to be seen.

The Bond Market.

It is interesting to note the following comment on bonds in general and irrigation bonds in particular, from the monthly letter of Farson Sons & Company, New York and Chicago:

"A preponderance of evidence indicates that throughout the entire country there is a feeling of security and satisfaction over the business situation seldom, if ever, equaled. Manufacturing seems fully revived, and excellent crops with high prices tend toward a prolonged period of prosperity. The truest reflection of those conditions is the fact that November and December show the greatest business ever handled by the leading trunk line railroads in the United States.

"All this has its bearing on the bond market. Banks, trust companies, insurance companies, fraternal organizations and all classes of bond investors are influenced by this feeling of confidence—the market for the better class of higher income bonds being excellent. Those investors who formerly were slow to investigate

irrigation, drainage and timber bonds netting from 5 to 6 per cent are now not only looking into these securities, but actually are absorbing almost more than the conservative bond houses can procure. It is well demonstrated that the security back of high-grade irrigation, drainage and timber bonds is ample for the most conservative investors. It is also demonstrated that owners of such properties, as well as municipalities, can well afford to pay 6 per cent for money.

"Prosperity brings with it high prices. These prices influence not only the luxuries, but the necessities of life. It is a fact that the price of living has increased over 100 per cent during the last ten years. This condition reflects itself in the bond market by a strong tendency of a large portion of bondholders to convert their lower income bonds into securities that will bring a more remunerative return and at the same time give absolute security of principal.

"The market for low income bonds, however, is not dead, and during the last few weeks has shown much life. As there are different personalities, so there are different ideas as to what a bond should represent. Certain institutions also are limited by old laws to this class of securities. Good bonds paying all the way from 3½ to 4 per cent are always in demand. The low prices of these bonds at the present time make them especially attractive, and we predict that those persons desiring securities of this class will not find a better market to purchase them in than that we are now experiencing."

Congress To Study Irrigation Question.

To the thousands of innocent settlers who were led to file on land under government irrigation projects in the expectation that water would be supplied to the parched acres within a reasonable time, but who have been subjected to a series of disappointments and are even now seemingly far distant from that joyful day, the present session of congress is filled with grave import.

Aside from the unanimous demand of western representatives at Washington, President Taft has promised his support to an act to authorize the issuance of government bonds for the completion of the federal reclamation projects. Whether or not these forces can outweigh the opposition and secure the desired legislation, is a question that cannot be determined until the general policy of the session may be more fully outlined.

It is claimed that certain interests in the east are working for a do-nothing session and will therefore attempt to throttle all aggressive action toward discussion and disposition of new projects. If this policy prevails, it is fair to conclude that the west must endure still slower progress on its government reclamation work.

Comment on the proposed bond issue as given in the eastern press leads to the belief that the real nature of this loan is either grossly misunderstood or is intentionally distorted for political purposes.

Notes on Practical Irrigation

D. H. Anderson

PARTICULAR SOILS,

Their Adaptation to Varieties of Plants—Functions of Organic and Inorganic Elements.

Although these notes are intended to apply exclusively to irrigation, that is, the artificial application of water to lands deprived of a sufficient rain fall to raise a crop, such as the arid and semi-arid lands, which constitute so vast a portion of our western country, yet, as all arable or fertile soils in whatever part of the world they may be, must contain certain elements necessary to plant life, an inquiry into the specific nature of soils will supply whatever information may be needed to till irrigable lands, as successfully as those where a rain fall may be depended upon to raise a crop. It is even possible that such information may be of greater practical value, because the elements in the soil and the crop itself, are under better control and management when the necessary water is in an irrigating ditch, than when it is in a cloud beyond control.

As a matter of fact, there is very little difference in soils as such, wherever they may exist. All of them are capable of producing some variety of plant life, unless absolutely barren on account of the absence of plant food, as the Desert of Sahara, for instance, or by reason of an excess of the elements essential to plant life, as our so-called "alkali lands." But, when it comes to the comparative quantities of organic and inorganic elements to be found in all soils, there is a vast difference, particularly when crops of a certain kind are to be successfully raised.

Soil Has Two Elements.

It was stated in the last chapter that soil consists of inorganic and organic elements. The inorganic material being decomposed rocks and mineral; to be more precise, such as were never endowed with life, and the organic material consisting of decomposed vegetable matter, which once possessed some form of life, both of which elements are absolutely necessary to grow any kind of plant.

A little experiment, which any one can perform, will make this clear to the reader. When any vegetable substance is heated to redness in the open air, no matter whether it be a peach or a potato, a strawberry or a squash, a handful of straw or a beautiful rose, the whole of the so-called organic elements, which are carbon, hydrogen, oxygen, and nitrogen, are burned away and disappear, but there remains behind an "ash" composed of potash, soda, lime, magnesia, iron, etc., which does not burn, and which, in most cases, does not undergo any diminution when exposed to a much greater heat. It is this "ash" which constitutes the inorganic portion of plants.

The predominance of certain of these substances, which, it was stated in the last chapter, are absorbed from the soil by the operation of plant life, is what enables agriculturists to give certain names to various kinds of soils, which names, however, are of very little prac-

tical importance, except to enable a farmer to specify which of them are best adapted to the varieties of plants he desires to raise.

So far as these inorganic substances are concerned, they must exist in the soil in such quantities as easily to yield to the plant, so much of each one as the kind of plant specifically requires. If they be rare, the plant sickens and dies just the same as does an animal when deprived of its necessary food. The same thing will happen if the organic food supplied the plant by the vegetable matter in the soil be wholly withdrawn. It should be noted, however, that a plant will sometimes substitute one inorganic element for another, if it does not find exactly what it requires, as soda for potash, the tendency of every plant being to grow to perfection if it possibly can do so. This matter will be treated at length in the chapter on "Plant Foods."

The following table of the essential inorganic elements found in soils will prove useful and well worth study. The first column gives the scientific, technical name of the elementary bodies; the second column the elements or substances they combine with, and the third column contains the result of the combinations, that is, the various substances ready to form salts which enter into the life of the plant.

Elementary Body	Combined With	Forming
Chlorine	Metals.	Chlorides.
Iodine	Metals	Iodides.
Sulphur	Metals	Sulphurets.
Sulphur	Hydrogen	Sulphuretted Hydrogen.
Sulphur	Oxygen	Sulphuric Acid.
Phosphorus	Oxygen	Phosphoric Acid.
Potassium	Oxygen	Potash.
Potassium	Chlorine	Chloride of Potassium.
Sodium	Oxygen	Soda.
Sodium	Chlorine	Chloride of Sodium, or Common Salt.
Calcium	Chlorine	Chloride of Calcium.
Calcium	Oxygen	Lime.
Magnesium	Oxygen	Magnesia.
Aluminum	Oxygen	Alumina.
Silicon	Oxygen	Silica.
Iron and } Manganese }	Oxygen	{ Oxides.
	Sulphur	{ Sulphurets.

All the above elementary substances, except sulphur, exist only in a state of combination with other substances, principally oxygen, and are found only in the soil; in no combination are they generally diffused through the atmosphere, so as to be capable of entering into the life of the plant through the leaves, or those portions above the ground. Hence, they must be taken up by the roots of plants, for which reason they are said to be the necessary constituents of a soil in which plants are expected to grow.

Inorganic Matter in Soil.

The enormous quantity of inorganic matter in soil may be estimated by a simple calculation. Out of five hundred samples of soil gathered from different parts of the world, the average weight of a cubic foot, wet, has been found to be 126.6 pounds. Now, let us ascertain how many pounds of mineral, or metallic salts exist in an acre of soil, say eight inches deep, the usual tilled depth, or surface soil; of the subsoil, we shall speak later on. We shall give the chemical analysis of an ordinary alluvial, or river bottom soil, such as is common in the western lands. The first column gives the name of the mineral, and the figures in the second column the parts of the mineral in an agreed one hundred parts, and the third column

the weight of each substance in the surface soil eight inches deep:

Elementary bodies and their combinations.	Percentage	Weight in pounds
Silica and fine sand.....	87.143	3,203,781+
Alumina.....	5.666	208,308+
Oxides of Iron.....	2,220	81,617+
Oxides of Magnesia.....	0.360	13,235+
Lime.....	0.564	20,735+
Magnesia.....	0.312	11,470+
Potash combined with Silica.....	0.120	4,411+
Soda combined with Silica.....	0.025	919+
Phosphoric Acid combined with Lime and Oxide of Iron.....	0.060	2,205+
Sulphuric Acid in Gypsum.....	0.027	992+
Chlorine in common Salt.....	0.036	1,323+
Carbonic Acid united to the Lime...	0.080	2,941+
Humic Acid.....	1.304	47,941+
Insoluble Humus.....	1.072	39,411+
Organic substances containing Nitrogen.....	1.011	37,169+
Total Inorganic and Organic substances.....	100.	3,676,464

It should be remembered that these immense quantities are contained in only eight inches of top soil, and that twelve inches, or one foot of soil, which is about the depth before reaching the subsoil, would contain a total of inorganic and organic matter equal to 5,514,696 pounds, or 2,757 and one-third tons.

The calculation is made by multiplying 43,560, the number of square feet in an acre, by 126.6 pounds, the estimated average weight of one cubic foot of wet soil, which gives the weight of one acre twelve inches deep. Then dividing by twelve, we get the weight of an acre one inch deep. To ascertain the weight of eight inches, we have only to multiply by eight inches, and again multiply by the number of parts of any organic or inorganic matter to ascertain the exact weight of that particular matter in the acre, thus:

$$43,560 \times 126.6 = 5,514,696 \text{ pounds per acre one foot deep.}$$

$$5,514,696 \div 12 = 459,558 \text{ pounds per acre one inch deep.}$$

$$459,558 \times 0.120 = 551.46960 \text{ pounds of Potash in one inch acre.}$$

$$551.46960 \times 8 = 4,411 \text{ pounds of Potash in acre eight inches deep.}$$

Five right hand figures must be cut off, three for the decimal places and two more because the calculation is based on a percentage of one hundred parts.

The average weight of a cubic foot of dry soil, according to the foregoing estimate, based upon the tests taken in the cases of five hundred soils collected from various places on the globe, is 94.58 pounds, which will make the dry soil acre eight inches deep weigh 2,715,792 pounds, a difference in weight between wet and dry soils of 960,672 pounds per acre eight inches deep, which, of course, represents the weight of water.

This information will prove of value in considering the question of applying water to the soil. As a rule, the proportions of inorganic and organic matter remain about the same, except that the application of water by irrigation adds to the quantity in soluble matter carried to the soil, which is greater in the case of irrigation than when rain is depended upon, humus and salts in solution being carried in the ditch water.

By referring back to the test table of a specimen soil, it will be noticed that the first twelve substances are "inorganic," and the three last "organic." It will also

be noticed that the proportion of inorganic matter is vastly greater than that of the organic. It is necessary that this should be so, for the organic matter is the "active" principle, the dynamic force, and the inorganic matter the "passive" principle. If the proportions were reversed, the inorganic matter would react upon and destroy itself, and as it could not be replaced very well, there would soon be an end to the growth of plants. Hence, nature provides a store-house of raw material, so to speak, to be utilized in the manufacture of plant food, and it is practically inexhaustible, the subsoil, for an unlimited depth, containing all the ingredients necessary to restore the top soil should it become jaded and unresponsive to the demands of cultivation and fertility, if the farmer will take the trouble to dig down after them and bring them to the surface.

Moreover, the inorganic elements in the soil are per-



SOPHUS RICHARD,

General Manager and Treasurer, French Land & Irrigation Company.

manent. They are insoluble except when acted upon by the acids formed through the chemical action of the organic matter, and the vital force exercised by the growing plant.

In the table of specimen soil, given on another page, the percentage of inorganic matter passes 95 per centum, while the organic matter is about three and one-half per cent. Yet that particular soil is a fertile one, in which it is possible to produce a good crop of any kind of plant. It is only an analysis, it is true, and a chemical analysis is not always to be depended upon, because there are so many unknown and mysterious applications of the laws of nature, but there are many things to be said in favor of ascertaining what ingredients the soil does contain, approximately, if not with rigorous exactitude. It gives the practical farmer valuable information in the form of suggestions for the improvement of the soil. It

(Continued on page 100.)

EXHIBIT OF THE DAHLHJELM COMPANY AT U. S. LAND AND IRRIGATION EXPOSITION.

The exhibit of the Dahlhjelm Company at the United States Land and Irrigation Exposition, held at the Coliseum, Chicago, November 20 to December 4, attracted a great deal of attention and favorable comment, especially from engineers and irrigation experts, who united in pronouncing the underground pressure system the most satisfactory system yet produced.

As heretofore noted in these columns the orchards of the Lewiston Land & Water Company, Limited, for

and vineyards were displayed, also apples on platters and grapes, peaches and plums in jars were exhibited in such a way as to make a very striking and pleasing exhibit.

So far as the Dahlhjelm Company are concerned the results from the Land Show are proving very satisfactory.

The exhibit was in charge of Mr. Richard S. Thain, resident manager of the Dahlhjelm Company, whose offices are at 1206-8 Schiller building, Chicago. Mr. Thain was assisted by the following salesmen: Messrs. E. N. Read, F. B. Millar, H. S. Fish, R. D. Bokums, Jr., and I. C. Humphrey.



Exhibit of The Dahlhjelm Co., Showing Products of the Lewiston Land and Water Co., Ltd., Lands, Near Lewiston, Idaho.

whom the Dahlhjelm Company are the sole selling agents, are irrigated by this system, the water being supplied from the Sweetwater reservoir, which is at an altitude of one hundred and fifty feet above the average altitude of the Lewiston orchards. From this reservoir the water is conveyed in large pipes to relief reservoirs and from thence to each five acres in the Lewiston orchards, five acres constituting the selling unit.

In the exhibit of the Dahlhjelm Company large photographs illustrating the irrigation system, also orchards

A photograph of the Dahlhjelm Company exhibit is presented herewith.

NOTICE TO NEW SUBSCRIBERS.

Notice is hereby given to the hundreds of new subscribers who are entitled to a paper-bound copy of the Primer of Irrigation, in connection with their subscription to IRRIGATION AGE, that owing to slight revisions necessary in the text of the Primer we will not deliver copies until about January 25, 1910.

U. S. LAND AND IRRIGATION EXPOSITION

Many Exhibits in Chicago Show—Large Attendance of Chicago Residents—
Exhibitors Form Permanent Organization—Full Text of Resolutions

An exposition of agricultural and horticultural products, from irrigated as well as rainfall sections of the country, was the method adopted by the Chicago Tribune in furtherance of the general subject of farm home-building, and to bring the farm, so to say, to the doors of the city dweller. The exposition was held in the Coliseum, which was beautifully decorated at lavish expense, the plans of the architects carried out so as to harmonize all of the exhibits.

The attendance during the two weeks of the exposition is estimated at 300,000, although as yet no authentic figures have been given out. As to how much of this attendance was upon the part of Chicago people, and how much outside sources there is no means of determining.

The exhibitors, generally, were well pleased with the results. There was, however, considerable criticism of the management of the show, and representatives of many of the western states decided that an event of this magnitude should be conducted, if at all, by the exhibitors themselves, who in turn could reasonably expect the support of all of the newspapers of a city like Chicago, rather than that of a single publication, even though as strong as the Chicago Tribune.

At various meetings held during the last week of the exposition, plans were formulated for perfecting an organization to conduct future exhibits, independently of any one newspaper, and the following resolutions were drawn up by a committee appointed for that purpose, and adopted at a subsequent meeting:

WHEREAS, The various commercial bodies and financial institutions interested in the development of arid lands have united in placing a very large and splendid exhibition of the products of the irrigated sections at the United States Land and Irrigation Exposition, from November 20th to December 4th, 1909, inclusive, and that it has been a success in a great many ways, and enabled those exhibiting to show in a proper manner the wonderful products brought forth by sun, irrigation, and an extremely fertile soil; and

WHEREAS, We believe the Exposition will prove of great value in the development of the arid sections, and will be an uplifting force in the United States, inasmuch as it will act as a teacher to those who live in crowded, unhealthy districts in other cities, or who have capital which they seek to invest profitably, that health, wealth and independence are to be felt by all industrious and intelligent men who cast their lot in the irrigated sections; and

WHEREAS, As such exhibitors, we feel that great credit is due to those who conceived the idea of the United States Land and Irrigation Exposition, and that we are very grateful for the manner in which they have carried out their conception; and

WHEREAS, As we believe that the Exposition should be a permanent annual feature, therefore

Be it Resolved, That it is the sense of this meeting composed of exhibitors from States under the Reclamation Act that a permanent organization of all persons interested be formed for the furtherance of our mutual interests. We believe that such organization should be a general one, embracing all of the States included in the Reclamation Act, and that its purpose should be mutual co-operation in the matter of future exhibitions, wherever and whenever held.

We recommend that each exhibitor in attendance here return to their respective homes and take steps to bring about a State Organization which will send delegates to a general meeting to be held on or before the first week in April, 1910, at Salt Lake City, said delegates to be empowered to pledge the industrial interests of their respective States to abide by the decisions of this Executive Board with reference to exhibits at National Industrial Expositions in the future; and

Be it Resolved, That it is the sense of this meeting that such executive committee or board of control shall recognize only such cities, commercial bodies or other organizations who desire to secure industrial exhibits from the States referred to as can pledge the entire support of the public press in their respective States and localities.

Be it further Resolved, That we pledge the support of the people of irrigated areas to Expositions held under such auspices.

Be it further Resolved, That we hereby express our appreciation for what has been done, and for the opportunities that have been afforded us to make a display of our products, and we feel that the Chicago Tribune is especially entitled to the thanks of all for the good which has been accomplished.

Your committee of Vice-Presidents respectfully suggest as a name for this organization UNITED EXPOSITION ASSOCIATION OF IRRIGATED STATES.

C. J. Sincell, President, Boise, Idaho; Reilly Atkinson, Secretary, Boise, Idaho; Vice-Presidents, H. M. Gilbert, North Yakima, Wash.; Jos. A. Wilson, Hood River, Oregon; Dr. Clarence E. Edwards, California Promotion Bureau, San Francisco; D. R. Hubbard, Boise,

Idaho; Dr. E. D. Ball, Logan, Utah; Dwight Woodruff, Hamilton, Mont.; Prof. B. C. Buffum, Worland, Wyoming; Lee Haney, Colorado Midland Railway, Denver, Colo.; W. B. Henning, Bureau of Immigration, Albuquerque, N. M.; R. L. McMillan, Dalhart, Texas; Rodney C. True, Experiment Station, Reno, Nevada.

DESCRIPTION OF EXHIBITORS' BOOTHS.

The Pueblo Chieftain, Pueblo, Colo. The interests of the Chieftain were taken care of by Messrs. J. A. Barclay, John F. Reardon and J. F. Ferris.

The Morris Machine Works, Baldwinsville, N. Y., represented by Henion & Hubbel, of 223 North Jefferson street, Chicago. An interesting exhibit of pumping and dredging machinery designed for irrigation and dredging purposes. This exhibit was in charge of Mr. R. C. Wise.

International Harvester Company of America, Chicago, Ill. Model of farm with background of mountain scenery, the farm being given the semblance of life by sheaves of wheat and other products artistically distributed. The central part of this exhibit was the Auto Pump manufactured by this company.

Western Michigan. The exhibit of the district bordering upon Lake Michigan from Muskegon county to Emmett county comprising fifteen counties, to which a very large amount of space was devoted for the presentation of field crops, fresh and canned fruits and vegetables, and apples in boxes. A striking feature of the display was the columns of apples ascending to the roof of the exhibit, and held in place with cylindrical wire cages. The exhibit was in charge of Mr. R. B. Hendel, representing the interests of the Western Michigan Development Bureau.

The California-Texas Land Company presented interesting views of sections of California and Texas by means of a revolving screen. This exhibit was in charge of Mr. Hogan.

Enid, Ochiltree & Western Railroad Company, "The Pan-handle of Texas." Exhibit of Pan-handle products, including Kaffir Corn, Milo Maize, Alfalfa and Sugar Beets.

The State of Utah. Too much cannot be said in praise of this artistic and interesting presentation of the resources of the fertile valleys and treasure-bearing hills of Utah. The handsome trophies won by the State at various Irrigation Congresses in competition with displays from other states, were among the most interesting sights displayed at the Exposition. The beautiful cup donated to the Sixteenth National Irrigation Congress at Albuquerque by W. R. Hearst, and awarded to the State of Utah for the finest state exhibit of fruits, was the centerpiece of this rich display. Of especial interest were the exhibits of preserved fruits and vegetables emblematic of the industry of packing, which has made such great strides within the last few years. Fifty-six varieties of asparagus were shown. The Utah exhibit was not confined to that of agricultural products, a fine display of her mineral resources being made. The Utah-Idaho Sugar Company showed beet sugar in various stages of manufacture; from the growth of the plant to the finished product. The exhibit was in charge of Mr. Thos. Judd, president of the State Board of Horticulture, Mr. G. E. Taylor, State Inspector of Horticulture, and E. D. Ball, director of the State Agricultural College.

North Central Washington. Under this head were grouped exhibits of that part of the State, representing three different interests. First: the exhibit of the Neeley & Young Company, of Spokane, Wash., and Suite 501, 115 Adams street, Chicago. Mr. F. Comstock Mintie of Spokane being in charge. It will be recalled by those who attended the Seventeenth National Irrigation Congress at Spokane last August that it was through the enterprise and liberality of this firm that the very interesting and instructive display of irrigation systems em-

bracing every known device was presented to the delegates, upon one of the firms' properties a few miles east of Spokane.

The Wenatchee Valley Commercial Club. This exhibit of magnificent apples in charge of Mr. Wilmroth, Secretary of the Club, and one of the Lecturers upon behalf of the Washington Development League.

The Great Northern Railroad, represented by Mr. E. C. Leedy, who has succeeded the late Mr. Max Bass as General Immigration Agent of the Railroad, and by Mr. J. J. Mooney; these completing the exhibits grouped as "North Central Washington."

The State of Minnesota. A great deal of credit is due the State Board of Immigration, which was responsible for this interesting and picturesque exhibit, which was in charge of Mr. Geo. Welsh, State Commissioner of Immigration, and Mr. Fred D. Sherman, both of whom at times delivered stereopticon lectures on their state.

Council Mesa Orchard Company, 426 Marquette Building, Chicago, in charge of Miss Dora Jones. Exhibit of apples raised by irrigation in the famous Council Valley of Idaho.

American Well Works, of Aurora and Chicago, Ill., in charge of Mr. Geo. W. Igo. An exhibit of centrifugal deep well pumps, their product being well known and in extensive use throughout the west, and having been awarded two Grand Prizes and four Gold Medals at the Alaska-Yukon Exposition. This exhibit attracted much attention.

Meade County, Kansas, showing an artesian well in operation in the center of a grass plot. This exhibit was in charge of Dr. W. W. Simpson and C. S. Hulbert.

El Paso, Texas. The term "striking" is an inadequate one to apply to the exhibit which bore the name of "El Paso," but which, owing to the liberal spirit for which El Paso people are famous, might better have been termed the exhibit of the "Rio Grande Valley." The exhibit, if such it can be called, consisted of a topographic model of the famous Rio Grande Valley, embracing that part of it from what is known as "Elephant Butte," to the city of El Paso, showing the northern unit of the Government's spectacular "Rio Grande Reclamation Project." This miniature reproduction, not only of the country to be benefited by this enterprise, but of the country for hundreds of miles east and west of it was executed with a faithfulness of detail and accuracy of description—the whole being illuminated from beneath—that is difficult to describe. There can be no question that many people were enabled for the first time to grasp an idea of the immensity of this enterprise, and of the character of the country, which at some not distant date will be one of the richest agricultural sections of the world.

Routt County Colonization Company, Denver, Colorado. A reproduction, in miniature form, of the section of the "Carey Act" irrigated lands in the Little Snake River Valley in Routt County, comprising 60,000 acres of fertile soil. The exhibit was in charge of Messrs. C. E. Wantland, Hebarton, Bronson, Haste and Keffer.

The San Luis Valley, Colorado. An exhibit of grains and field products raised in the famous San Luis Valley of southern Colorado. This exhibit was in charge of Mr. G. R. Moore, 811 Railway Exchange building, Chicago, Ill.

Garfield County, Colorado, on the western slope of the Rocky Mountains, Glenwood Springs being the county seat, showing irrigated products, including potatoes from the Carbondale district. The miniature train passing through Hell-Gate over the Colorado-Midland Railroad attracted much attention. The exhibit was in charge of Messrs. W. P. Clough, Lou D. Sweet and F. E. Sweet.

Little Rock, Arkansas. Exhibit of the products of the territory adjacent to Little Rock, including field crops and rice, for the production of which irrigation by pumping is necessary. The exhibit was in charge of Messrs. Speed, Bodeman, Ratteree and Waters.

Alexandria, Louisiana, Progressive League, products of central and northern Louisiana, in charge of M. L. Alexander, Secretary of the League.

St. Louis & Southwestern Railroad, "The Cotton Belt Railroad," showing products of southwestern Mis-

souri, Arkansas, northwest Louisiana and Texas, in charge of Mr. Guy L. Stewart, Agricultural and Industrial Commissioner of the road.

Calhoun, Denny & Ewing, of Seattle, Washington, with Chicago offices at 801 Stock Exchange building, displayed products of Yakima Valley irrigated fruit lands under private and community ditch systems. This company plants orchards and cares for them for non-resident purchasers. Mr. C. F. Bishop, Jr., had charge of the exhibit.

Algoa Orchards, of Algoa, Texas, display of semi-tropical and citrus fruits, in charge of Mr. L. H. Payne, sales manager of the company.

West Plains, Howell County, Missouri, on the southern slope of the Ozarks. The exhibits of the products of this section were in charge of Mr. L. A. Sutherland.

Denver Reservoir Irrigation Company; this being one of the smaller exhibits of the Trowbridge & Niver interests, to which reference will be made later. The exhibit was in charge of Messrs. Milnarnow and Davis.

J. C. Vining Investment Company, of Denver and Grand Junction, Colorado. Exhibits of products of irrigated lands in the famous Grand Valley between Palisades and Fruita. The Chicago office of this company is located at Room 815, 135 Adams street. The exhibit was in charge of Mr. N. D. McDonald, of Chicago.

Julesburg Land Company, of Julesburg, Colorado. This exhibit was in charge of Mr. Church D. Todd of Chicago and Mr. Thompson of Julesburg. The exhibit consisted of a very interesting display of Sedgewick County products raised by irrigation and dry farming.

Salt River Valley of Arizona. This exhibit was in charge of Mr. Arthur L. Waterhouse, representing the Phoenix Board of Trade, and embracing the exhibit of the Bartlett-Heard Company of Phoenix, represented by G. W. Cate and C. T. Hirst. This exhibit can easily be classed among the Star attractions of the Exposition, and judging from the crowds of interested people who swarmed before it day and night, the Salt River Valley of Arizona will soon become one of the most populous sections of the country. It is to be expected that the products presented for public inspection would be unique, considering the climatic advantages enjoyed by this section, which render it peculiarly attractive for the growth of remunerative crops which do not thrive in any other part of the country. The earliest oranges in the market, dates, figs, olives and grape fruit should prove a lodestone to intending home-seekers. The exhibit of the Bartlett-Hard Company consisted of a house built of bales of alfalfa, of which five and six cuttings are harvested during the year. The Bartlett-Heard Company is the owner of a large tract of ranch land in the vicinity of Phoenix, which is being sub-divided and sold to settlers in small tracts, with water from private ditches or from Government canals, as may be preferred. The fact that the Government's project is almost completed and will be finished next year, together with the low charge for water, and the possibilities of electrical development make this valley, at the present time, a peculiarly favorable one.

State of New Mexico. Any doubt in the minds of the layman as to the possibilities rife in New Mexico must have been removed after viewing the magnificent display by the New Mexico Bureau of Immigration upon behalf of the Territory, all of the irrigated districts of the Territory being represented by displays of fruits, vegetables and grains. For a more extended account of New Mexico and its present state of development we refer the reader to an article elsewhere in this issue, which contains a statement made by Mr. H. B. Hening, Secretary of the New Mexico Bureau of Immigration, who was in direct charge of the exhibit. The other gentlemen representing the interests of the various parts of the territory were Messrs. C. W. Colbert, Jas. Mead, A. L. Cox, W. A. Ellis and Geo. H. Webster. That the territory is inhabited by a class of live American citizens is well evidenced by the fact that all of these gentlemen should have evinced their interest in their Territory to the extent of attending the exposition as representatives of various parts of the State, and in such numbers.

Luther Burbank's wonderful discovery, the thornless Cactus, which, according to the statements of the Wizard, will revolutionize the dairy and cattle business, and give to humanity a food at once wholesome and delicious.

California. No attempt was made to make a display of the resources of California, but the California Promotion Committee had established headquarters in charge of Dr. Clarence E. Edwards and Miss Chapline, where information and literature regarding California was distributed. Dr. Edwards, in a communication to the AGE, states that during the time of the Exposition fully 3,000 people registered at the Information Bureau, of whom he felt confident fully 2,700 would go to his state. During his twenty-one days' stay in Chicago Dr. Edwards delivered nineteen lectures to 15,000 people. It is hardly necessary to make any extended mention of California's well-known attractions in this connection.

The Dahlhjem Company of Lewiston, Idaho, with a Chicago office at 1206 Schiller Building, in charge of Messrs. R. S. Thain, E. M. Reed and F. S. Millar, H. S. Fish, R. D. Bokum, Jr., exhibiting Lewiston Land & Water Company's irrigated lands.

The French Land & Irrigation Company of French, New Mexico, displayed an exhibit which attracted more than ordinary attention, owing to the fine display of fruit and vegetables, as well as grains. This booth was in charge of Mr. Maxson of the Chicago office, who furnished all callers with detailed information concerning the opportunities for home-building under their project. The French Land & Irrigation Company's offices in Chicago are on the sixth floor of the Atwood Building, where intending purchasers may secure further data and information upon application, as well as a lot of good literature gotten out by this company.

The Twentieth Century Grader and Sage Brush Grubber, manufactured by the Baker Manufacturing Company, 726 Fisher Building, Chicago, Illinois, had one of their latest models on exhibition. This booth was in charge of Mr. C. C. Stewart, who was kept busy answering questions and demonstrating the machine.

Denver Reservoir & Irrigation Company showed a model of the irrigation system of the Company, together with an exhibit of products.

Standley Lake Irrigation System of the "Denver-Greeley" Irrigation District. This also is one of the numerous projects financed by the firm of Trowbridge & Niver Company of Chicago.

Bitter Root Valley Irrigation Company, of 100 Washington Street, Chicago, and Hamilton, Montana, in charge of Messrs. Dwight L. Woodruff, F. D. Nichols, Jas. B. Ransen, T. S. Miller, G. B. Nash, R. E. Mathews, J. M. Lovett and E. W. Herbst. This display, being located at one end of the building, the opportunities for making it effective were utilized to the utmost. A large map of the Bitter Root Valley, showing the irrigation system and towns, and the topographic features being clearly shown, together with a display of irrigated products.

The State of Wyoming. This exhibit was in charge of Mr. R. A. Whitely from Cheyenne and Professor Buffum of the State Agricultural Experiment Station at Worland, who delivered lectures on Wyoming during the week. The space reserved included exhibits from the Eden Irrigation & Land Company, the financial sponsors of which are Messrs. Farson Son & Co., of Chicago, and which has frequently been referred to as one of the last of the first-class Irrigation Projects offering water-rights at a minimum figure; also of the Wyoming Land & Irrigation Company of Greybull, Wyoming, which has developed a tract of 15,000 acres under their Shell Creek canal. The State exhibit was a part of the permanent collection maintained at Cheyenne in charge of Mr. Whitely. A free information booth was maintained by the State, at which circulars describing its resources, prepared by Mr. Robt. P. Fuller, the State Land Commissioner, were distributed gratis. The display of the State was very interesting, and consisted of practically all the products of the temperate zone. Particularly interesting were some as yet unnamed forage grasses, produced by scientific plant breeding upon the part of the Wyoming Plant & Seed Breeding Company, of Worland. While it is estimated that there are water resources in the State

sufficient to reclaim a total of 10,000,000 acres, only about 1,500,000 acres have been segregated for this purpose.

Yates & McLain Realty Company of Colorado Springs, Colorado, made an interesting display of the products of this climatically favored district.

Baldwin County, Alabama. Sub-tropical fruits and fresh preserved, and "Casava," the new food plant. This exhibit embraced that of the Magnolia Spring Land Company of Chicago, with Mr. J. D. Foley in charge. The Alabama-Sumatra Company, in charge of Mr. P. S. Hamm, and the Baldwin County Colonization Company, a German organization.

Yakima Valley, Washington. Exhibit displayed by the United Commercial Clubs of Yakima Valley, representing the cities of North Yakima, Sunnyside, Toppenish, Zillah, and Prosser, all of these districts being a part of the Government's justly famed Reclamation Project. The exhibit was confined almost entirely to apples, and was donated to charitable institutions of the City of Chicago at the close of the show.

San Diego County, California. Exhibit, upon behalf of the county, represented by Mr. Jas. E. Jasper. This was made up of a beautiful collection of citrus fruits, apples and nuts, one of the prominent features being a large thermometer showing the daily range of temperature at San Diego, California.

Atchison, Topeka & Santa Fe Railroad. It must have been a source of gratification to this enterprising Railroad Company, which has done so much to lead thousands to a "better life" in the great Southwest, to witness the immense amount of interest aroused by its exhibit, crowded as it was to the point of discomfort from morning to night. As a matter of fact, it required the efforts of a number of police officers to maintain some semblance of order among the throng which gathered to view this exhibit, which consisted of an exact reproduction built of adobe brick of a typical Pueblo Indian dwelling and Navajo Hogan, with all furnishings, and of a number of Pueblo and Navajo Indian families, the whole set off by a painting in the background, representing a characteristic northern Arizona landscape.

Fort Smith, Arkansas. The chief feature of this exhibit was a farm wagon manufactured at Fort Smith, and loaded in an artistic manner with farm and garden products. Mr. W. S. Furman was in charge.

The Rock Island-Frisco Railroad Company. This exhibit consisted of a huge map 15 feet by 30 feet, showing all of the States traversed by lines of this road, its Cities and chief features, and agricultural products, and was arranged so as to present the view to the observer as being taken from the City of Chicago, looking south and southwest. Tastefully arranged exhibits of the products along its lines were arranged about the walls.

Southern Pacific Railway Company. Perhaps the largest amount of space in the hall devoted to one exhibit was that of the Southern Pacific and allied lines, consisting of four ingeniously devised models of farming scenes along its lines, backed up by panoramic views and displaying in order pictures of Central Texas and Louisiana, Southern California, Central California and the Hood River Region in Oregon and along the line of the Oregon Railway & Navigation Company. A miniature double-track railroad, traversing all these sections, and the boundaries between them by tunnels, with a complete block-signal apparatus, over which a miniature railroad was kept in constant operation, completed a series of pictures as artistic as they were clever. The entire display presented a faithful reproduction of the district mentioned, and was worked out with a faithfulness of detail and artistic feeling highly creditable.

Farson, Son & Co., Chicago, Ill., with offices in the First National Bank Building. This enterprising firm, which has behind it a record of creditable effort in the work of reclaiming Desert Lands in Wyoming and in other states under the provisions of the Carey Act, departed somewhat radically from the methods adopted by other exhibitors; in fact, it represented no display of its activities aside from what was shown in the exhibit of the State of Wyoming in connection with the Eden Land & Irrigation Company, whose securities were underwritten by it. Its entire large space was generously devoted to

the cause of hospitality by the installation of desks, chairs and couches for the recreation of those wearied with sight-seeing. the interior being beautifully and artistically arranged. The booth was in charge of Mr. W. G. De Celle, assisted by Messrs. Bartlett, Osborne, Small, Joiner, Thompson and Parrott.

Twin Falls North Side Land & Water Company projects, financed by J. S. and W. S. Kuhn, of Chicago and Pittsburg, and Mr. H. L. Hollister, of Chicago. The space devoted to this exhibit included panoramic views of Southern Idaho and the Twin Falls region, reclaimed by the company, on the one hand, and of the Sacramento Valley, the latest Irrigation Project undertaken by these enterprising gentlemen, on the other side, with an appropriate display of the products of these regions grouped about the sides of the exhibit. This display was in charge of Mr. H. L. Hollister, G. H. Moseley and W. H. Guilford.

Pecos Valley, New Mexico. G. W. Butler, of Lake Arthur, showing model of small acreage tracts of land, with artesian water supply for Irrigation and domestic purposes, being placed upon the market by Mr. Butler.

Denver Irrigated Farms Company, 1325 First National Bank Building, Chicago. A display of a model of the irrigation district near Denver, placed upon the market by this firm, in charge of Mr. C. J. Ton.

The Hood River Valley of Oregon showed a fine collection of irrigated fruits from that famous district, which were distributed to Chicago charities at the close of the Exposition.

Louisiana Meadows Company of Chicago, showing the lands in Southern Louisiana, which are being reclaimed by the Wisner interests, this being one of the most gigantic projects of drainage ever undertaken in the world's history. This company contemplates the reclamation of 1,200,000 acres, which are being placed on the market as fast as available. Exhibits of the soil and of the products possible in that section made up the exhibit.

State of Idaho. The State of Idaho occupied a very prominent place at the Exposition. As a matter of fact, it was not restricted to one exhibit, but consisted rather of a group of exhibits representing a number of the Carey Act projects, as well as Commercial organizations, and the interests of the firm of Trowbridge & Niver, the Chicago bond house. The various commercial clubs represented were the Idaho Falls Commercial Club, represented by Samuel Houston; the Blackfoot Commercial Club, in charge of T. R. Jones; the Twin Falls Commercial Club, in charge of Messrs. Hill and McPherson, and the Boise Commercial Club, in charge of Mr. D. R. Hubbard, President of the Payette-Boise Water Users' Association; C. J. Sinsel; Mr. Riley Atkinson, as a representative of Governor Brady; the Caldwell Commercial Club, represented by H. D. Andrews; the commercial club of Nampa. The Carey Act enterprises financed by the firm of Trowbridge & Niver Company were individually represented by appropriate displays, and included the Big Lost River Irrigation Company, represented by Messrs. Clinton, Hurtt, McCollum, Fraser and Hanna of the firm of Clinton, Hurtt & Co.; The Twin Falls South Side project, and the Boise-Owyhee Project of the Boise-Owyhee Irrigation Company displaying a finely executed model of the lands coming under this project, amounting to 173,000 acres in Oregon and 77,000 acres in Idaho. It is a matter of regret that the limited space that can be devoted to what must necessarily be a brief mention of each exhibit will not permit an extended description of the resources of the State of Idaho as shown at this exhibit. The amount of interest taken in the subject by the representatives of the State can be divined from the fact that no less than sixty-nine residents of the Gem State were in attendance throughout the two weeks.

Federal Government. A feature which certainly added prestige to the Exposition, and which may well be said, to use a trite phrase, "was worth the price of admission in itself" were the exhibits of the Federal Government, as displayed by the Department of the Interior and the Department of Agriculture, and embracing a large part of the Government exhibit displayed at Seattle, and brought to Chicago, intact, for this Exposition.

The exhibit of the Department of the Interior was in direct charge of Mr. J. C. Boykin, and included, first, the exhibit of the United States Reclamation Service, in charge of Mr. J. C. Waite of the Settlers' Information Bureau of the Service, with headquarters in the Federal Building, Chicago, and who did much, by his painstaking care and courtesy to visitors, to elucidate to visitors the many phases of Government reclamation. The exhibit consisted of a collection of beautiful illuminated transparencies grouped about the walls showing scenes upon twenty of the Government's Reclamation projects, and of a topographical model of the Salt River Project, showing the Roosevelt dam and the entire distributing system. Lectures upon the interesting subject of Government Reclamation were delivered by Mr. E. T. Perkins, Engineer in charge of the Chicago office of the Reclamation Service, and Mrs. Littlepage.

Second, the exhibit of the Geological Survey, Water Resources and Mineral Branches, in charge of Mr. W. S. Robbins. The survey showed a number of maps executed upon a gigantic scale, and a large number of illuminated transparencies, showing the work of the Survey and its various branches of service, including reproductions of some of the sublimest scenery upon the Continent. An exhibit of some local interest was that of the new oxygen helmet, devised for rescue work in mine accidents, which was utilized at the Cherry mine horror.

The exhibits of the Patent Office and the General Land Office were in charge of Mr. H. C. Armstrong. They included models of farm machinery in actual operation, from the earliest devices known to the Patent office to those of the very latest date, with a background showing flouring plant in operation; also exhibits of the most recent developments in the way of color photography and an anachromatic photography. The General Land Office had upon exhibit maps showing the distribution of public lands in the United States, charts of many kinds and ancient documents of much historical value.

The Forest Service branch had a magnificent display of illuminated transparencies showing model forestry methods and methods of reforestation, together with maps and charts.

In the Annex, on the second floor, in charge of Mr. Frank L. Gill of Washington, D. C., the Department had grouped exhibits from various bureaus.

As representing the work of the Experiment Stations, were shown models displaying various methods of putting water upon the land under varying conditions, together with models of apparatus used in the preparation of the land and the distribution of water; also displays of the results of nutrition and food investigations, consisting of vegetables, fruits and meats.

A particularly interesting display was that representing in actual quantity the various elements that enter into the composition of the human body.

The Bureau of Animal Industry displayed models—exteriors and interiors—of ideal dairy barns and models of dairy farms.

The Bureau of Plant Industry furnished a commendable display of the products of dry farming, in charge of Mr. McAdams, dry farming expert, also in wax models, the results of varying methods of packing, storing and shipping fruits, as well as the results of the latest investigations of Legume Bacteria, and of organisms in farm and city water supplies.

The Bureau of Etymology placed upon exhibition an extremely interesting collection of enlarged wax reproductions of fruit-destroying insects, and of disease-carrying mosquitoes.

The exhibit of Hawaii consisted of illuminated transparencies of that interesting country.

The general scheme of decoration was well designed. The Italian Pergola effect was carried out in the building of exhibit snaces, rafters and columns being entwined with festoons of maple leaves and electric light clusters. The sides of the building were covered with painted panels, representing typical western landscapes and scenes, while the two ends of the hall were relieved with immense paintings, one of them representing the Grand Canyon of the Yellowstone with a reproduction of the falls in the background, the other representing a view of Yosemite Valley.

THE CAREY ACT

A Review of Present-Day State Legislation and Regulations Under the Act

BY E. F. BOHM*

Member of Executive Committee Eighteenth National Irrigation Congress

In view of the vast amount of literature placed before the public within recent years, by the various companies operating under the Carey Act, it would appear at first glance as though all that could possibly be said upon the subject had been reiterated many times.

As a matter of fact, however, while the statutes governing Carey Act operations in the various states are, in the main, alike, the regulations authorized by the various land boards under the wide scope of authority granted them under the statutes, differ upon matters of some importance to him who undertakes to make a home upon "Carey Act" lands, and an exposition of the varying methods in vogue would be of interest to many. Beyond this, there are many who have a vague notion of the provisions of the Act itself—Federal and State—and if this dissertation will be of service to any, I will feel amply compensated for the efforts of its production.

It should be explained, at the outset, that the Federal Act leaves the State free to legislate as it chooses, subject, of course, to the general provisions of the Federal legislation.

And that, while the States, individually, have passed Laws in accordance with the Federal Act, the various Land Boards, created by State Legislation to administer these Estates, are endowed with authority to formulate such Rules and Regulations as in their opinion may be necessary; and that since such Rules and Regulations are at all times open to change or amendment, some of the statements herein made, may at some future time, be without force or be misleading.

The State Land Boards, in the enactment of Rules, have displayed commendable energy and forethought in attempting to adapt their requirements to the exigencies of what, in many cases, were new and untried situations.

As there may not be complete understanding of the Federal Act itself (the fundament of all other Carey Act Legislation), it may be well to refer to it briefly, and of the causes lying back of it, which interlaced, as they are, with the History of the growth of the Arid Land States, the development of the West, of the gradual appropriation by individual effort of Irrigation Waters to the point of exhaustion, and of the Legislative changes made necessary by changing conditions, which changes finally result in the passage of the Carey Act (and at a later date of the Newlands or Federal Reclamation Act) would furnish material for an interesting story, by itself.

Considering the recognized importance of the Carey Act, and of its beneficial effects, it is difficult to realize, that, at the time of its adoption, in 1894, it was necessary for its few advocates, headed by the Hon. Jos. M. Carey, at that time Senator from Wyoming, to introduce the measure almost clandestinely. The Act, in fact, made its first appearance as a "Rider" to an Appropriation bill, and it authorized the Secretary of the Interior to "contract and agree to patent to the States (named) in which may be found Desert Lands, not to exceed 1,000,000 acres of Land" under conditions laid down, which, with the Provisers included in the Amendment of 1896, are, briefly, as follows: First, that the State shall file a map and plans with reference to the Land

proposed to be irrigated, showing the water resources, and other data, at which time the Secretary of the Interior "shall reserve the Land applied for." "This reservation to date from the date of the plan and map, but to be of no effect, however, if the plans be not approved." From this it will be seen that the initial responsibility rests with the Department of the Interior; the more so in the light of recent Regulations to which I shall refer later. Second, the State is authorized to enter into contract with persons, associations, or corporations for the reclamation of the Lands, and for their settlement and cultivation. It is prohibited from disposing of them in any other way. Third, the State is authorized to create a lien to be valid against the separate legal sub-divisions of land reclaimed, for the actual cost and necessary expense of reclamation, and reasonable interest thereon, until disposed of to actual Settlers. Fourth, when an ample supply of water is actually furnished in a substantial ditch, or by artesian wells or reservoirs to reclaim a particular tract or tracts of such lands, then Patent shall issue to such state, without regard to settlement or cultivation.

The original Act was limited in its application to a period of ten years from August 18th, 1895—this was amended in 1901, to the effect that the States "were allowed ten years' time from the date of approval of their applications, during which to complete the reclamation of the lands applied for"—the lengthening of this period for the reclamation proposed, after the possible expiration of ten years, to be optional with the Secretary of the Interior, should the State have failed within that period to complete the scheme of Reclamation.

I take the liberty of quoting from the Rules and Regulations adopted by one of the States, and which are characteristic in their essentials of the rules of all of them, viz.: "The conspicuous part of the Act is the provision whereby a lien is authorized to be created by the State—to be valid against the *separate* legal sub-divisions of the Land reclaimed for the actual cost and necessary expense of reclamation and *reasonable interest* until disposed of to actual settlers" or "If an ample supply of water has been furnished" (as prescribed by law) "then Patent shall issue to the State without regard to settlement or cultivation." These provisions enable the state to offer the Investor substantial security for the money expended in Irrigation Works. Inasmuch as the benefits resulting from the construction of the works accrue to the land reclaimed, it is proposed that they stand pledged for the return of the capital thus invested. The mention of these regulations will be of interest to those contemplating Carey Act ventures.

To further safeguard operations under the Carey Act, the Department of the Interior has recently issued Regulations, under which the States are required to furnish the Federal Land Officials Annual Statements showing the names of persons to whom they have passed title and descriptions of the lands patented. The United States officials are charged with the duty of careful inspection of the lands requested for segregation to see that they fall within the classification of "Desert" and "non-mineral" Lands, as prescribed in the Federal Statutes, thus eliminating the possibility of settlement upon Land to which title subsequently could not be acquired within the meaning of the Act. Under date of May 1st, 1909, the States are further required to present, with their applications, the fullest data, to show that the plans proposed may be sufficient to thoroughly irrigate the Land to raise ordinary crops, for which purpose a statement by the State Engineer showing the amount of water available will be required, as well as other data, which the judgment or experience of the Federal Land Officials may suggest as necessary.

As Lands upon which deposits of coal or other minerals may be found will not be patented to the States under this Act, they are required to publish notices of the segregation of the lands asked for during a period of sixty days, thus permitting time for contest by reason of prior adverse rights or on account of the non-desert or mineral character of the Lands.

That the Carey Act was a few years in advance of the needs of the country to be benefited does not in any measure detract from the credit due the men instrumental in its passage. It is difficult to conceive of any legal device better adopted to the ends to be accomplished. Notwithstanding the enormous development that has taken place within recent years under the provisions of the Carey Act, and the severe test to which the Act has been subjected, it stands today in its entirety, as originally drafted—the Amendments subse-

*[Mr. Bohm, a resident of Cleveland and of Chicago, has taken a deep interest in Western land and irrigation matters, and during the past two years has made, upon his own initiative, an exhaustive study of the "Carey Act" and of the Federal Reclamation Act, visiting many of the irrigation projects and conferring with State and Federal officials. Upon his return from a recent tour of investigation of Northwestern projects, he prepared for the National Farm Land Congress an article embracing the leading features of the Carey Act as adopted by the various states, after several years experience with actual operations. Through the courtesy of Mr. Bohm we are enabled to present this resume of actual working conditions, under the Act, in the various states, in the belief that our readers will derive much information from its study.—Editor's Note.]

quent to 1901 providing simply for an extension of its application. The States and Territories, which, by Statute, have adopted the provisions of the Act and have passed Legislative measures in accordance with it, are as follows: South Dakota, Montana, Wyoming, Colorado, New Mexico, Utah, Idaho and Oregon. In their essential features, the Carey Act Statutes of the various states are similar—the provisions as to the qualifications to enter land and the securing of title being laid down by the Federal Statute of 1894, with its reference to the "Desert Land Act" of 1877, there can be no variations in this respect. In all of the States named, any citizen of the United States (or one who has filed his declaration of intention to become a citizen) of the minimum age of twenty-one, may file upon land under the Carey Act to the extent of 160 acres, in local sub-divisions of forty, eighty, one hundred and twenty or one hundred and sixty acres, even though he may have exhausted his rights under all the Federal Land Laws. One filing for an amount less than 160 acres does not exhaust the Entryman's rights; he is privileged to file upon lesser amounts, upon various projects if need be, and in different states, should he so desire, until he has exhausted his quota of 160 acres. Some of the States exclude married women from the benefits of this Act, while others—notably Wyoming—permit them to file.

It required several years to overcome the prejudice of Eastern financiers against Investments west of the Missouri River, during which period the Act practically lay dormant.

Although there is nothing in the Federal Statutes prohibiting the States from constructing the necessary engineering works, none of the States, with the exception of Utah, have adopted any Legislation toward this end. As a matter of fact, few of the States had funds at hand for this purpose, and, consequently there was no course open except that of letting contracts for the execution of works to outside parties, to be financed by them, with the lands and water rights pledged as first and prior lien security for their reimbursement.

It was not until the beginning of the present century that Capital commenced to appreciate the possibilities of the Carey Act. It was a field to be exploited that was entirely new and without landmarks of any kind. Capital is not always timid, but apparently it wished "to be shown."

The methods to be pursued by Companies desiring to contract with the States of Idaho, Wyoming and Colorado, for the reclamation of arid lands, may be accepted as being fairly representative of the methods pursued by the other States named, and may prove of interest alike to the intending Investor and to the Home-seeker.

So far as the latter is concerned, it would appear to be of some importance to him, also, to understand upon what his own Contract with the Company is based, although few seem to concern themselves with this feature. The Contracts as heretofore drawn between the States and Construction companies are not in all cases alike, being governed largely by the individual merits of each Project, and being subject to changes in the light of experience and a closer knowledge of conditions. The Statutes of the States named provide about as follows: First, a proposal is to be filed with the State authorities for the withdrawal of the Lands desired for reclamation. This proposal must describe the source of water supply, the lands to be reclaimed and the works by which it is proposed to reclaim them, the cost of the works and the price per acre, at which the works (including water-rights) are to be sold to Settlers.

It may be well to refer to the fact that the settler in acquiring "water-rights" is in effect, acquiring a proportionate interest in the entire Irrigation plant. The proposal is required to be accompanied by complete maps, plans and estimates. It is then referred by the Land Board to the State Engineer, whose duty it is to examine the plans, and to report upon the merits of the Project to the Board, and the approval of the Board is contingent upon the favorable report of the Engineer, in which case the Board applies to the Secretary of the Interior for the segregation of the Lands, and as soon as their reservation has been effected, the State enters into contracts with the Company. Usually a certified check for an amount determined by the Land Board is required to be deposited with the proposal as a guarantee of good faith.

The Company contracting with the State is essentially a Construction Company, whose duty it is, under the State Law, according to the terms of the contract and under penalty of forfeiture of a Bond, varying in character and amount according to the State contracting, to build the Irrigation

Works, and to furnish the necessary Capital therefore, the Investment of which is to be secured by a lien upon the land to be irrigated, and upon the Irrigation Works itself. The price of water-rights (usually disposed of through the medium of "shares" in an "Operating Company") (a subsidiary Company) is recited in the Contract, also, while the Contract between the Company and the Settler is subject to approval by the State authorities. The intending Entryman before filing upon Land is required to contract with the Company for water-rights (or shares in the works) in proportion to the amount of land filed upon. The Construction Company is, by Statute and Contract, limited to a certain period of time for the completion of the work.

A word of explanation with regard to State Land Boards: These are created in accordance with the Statutes of the various States and usually comprise three or four members, including the Governor of the State, the State Engineer, and other Officials, and the Boards are variously designated as "State Land Boards" or "Desert Land Boards." They are charged with the execution of the Statutes and with the administration of affairs thereunder. Most of the States have provided for an Official known as the "Secretary of the Board" or the "Commissioner of Lands," who receives a stated compensation for his services, and cares for all routine business. To secure the funds necessary to carry on the work, the Company is permitted to mortgage its equity in the Project.

The usual method of financing is to issue Bonds, secured, as before described, by a first mortgage against the Property described, the Construction Company executing a Deed of Trust, whereby all its Property, Rights and Franchises are transferred to a Trustee, by him to be held for the benefit of the Bondholders according to the terms and conditions recited in the Deed. These securities, of late years, have come to be regarded with much favor upon the part of Investors, they bear a six per cent interest rate, and, so far, have sold at a price to yield six per cent. They are issued to be retired serially in from ten to twelve years, and in denominations of \$500 to \$1,000; in some cases as low as \$100.

The Contract with the State provides that a release from the terms of the mortgage shall be given the Entryman when full payment has been made to the Company. The terms of the mortgage must, as a matter of course, conform to the provisions of the State Law, and must be approved by the Attorney-General.

The details of administration of the Irrigation Works while under control of the Company, and of the distribution of water are also subject to the approval of the State authorities, while copies of all the papers and maps are required to be kept on file for public inspection at the office of the Land Board.

It will be seen that the rights of both the Construction Company and of the Settler are adequately guarded by the Statutes and Regulations and, that, granted able and honest supervision upon the part of the State Officials, the risk of failure is reduced to a minimum. At present all Companies operating under the Act are required to furnish Annual Reports showing their Condition and the operations in detail. This provision is waived in the case of persons or Associations constructing works for their own use.

The various forms to be used in making entry and final proof, the forms of notices, proofs of cultivation, of final certificates, and of assignments of entry are all prescribed by the State, and will be explained in their order.

The details of administration and of general Legislation affecting Property Rights, etc., the lesser matters, but those which concern the entryman most as affecting his mode of living and future welfare, and which, as a rule, are forced upon his attention after he has taken up his residence or is called upon for deferred payments, will be explained at length, and the differences existing between conditions in various States pointed out.

(Continued in January Number.)

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.

FIRST NATIONAL FARM LAND CONGRESS

Initial Meeting Held in Chicago November 16-20, Creates Great Interest—Organization Promises Wide Influence—Delegates Are Enthusiastic—Hearst's Newspapers Are Hosts

In harmony with the prevailing tendency toward organized effort and the fixing of responsibility, the inception and successful execution of what has passed into history as the first and Creative session of the "National Farm Land Congress" is of peculiar interest to all whose thoughts have been directed towards the great problem of a rational distribution of the country's citizenship—present and future.



C. A. Walsh, Secretary National Farm Land Congress.

This unique enterprise, fathered by the "Hearst" Newspapers, under the able helmshmanship of Mr. C. A. Walsh, whose efforts were reinforced by the support of Commercial and Railroad interests of

Chicago, and of the officials of the Federal and State Governments, has demonstrated its right to continued and useful existence, and its potential value to the country at large.

The efforts of the Congress were focused entirely upon the development of rural life and towards the widening and stimulating of agricultural activities, by the widest possible dissemination of authentic and unbiased information of the resources of the country at large, and when the plans proposed, and embodied in the resolutions finally carried, are put into execution, it will be an easy matter for the home-seeker or intending agriculturist—no matter what his peculiar bias may be—to arrive at a satisfactory conclusion as to the merits of the various sections of the country, and of the other numerous phases of a subject so wide in its application as the choice of a career and a place to work it out.

Too much credit cannot be accorded to the Chicago Examiner for the part taken by it in this laudable undertaking or to the Executive Committee, through the combined activities of whom the Congress was made one of the most successful gatherings of recent years.

All the expenses of this undertaking, from its earliest inception—including the various entertainments tendered the Delegates—were borne by the "Examiner," and all the details of its administration were worked out by this publication, represented by Mr. C. A. Walsh, and by the Chairman of the Executive Committee, Mr. Don Farnsworth. That the undertakings of Mr. Hearst are carried through to successful issue without stint and without thought of expense is an axiom, and this occasion was no exception to the accepted rule. The large number of Delegates—representing all sections of the country, and their diversified interests—the presence among them of the large number of Officers and Members-at-Large of the Irrigation Congress and of the Dry Farming Congress—testifying to the desire of these two great Bodies to assist in this work—the elevated character of the program, and the interest displayed by the public at large, all bear ample testimony to the truth of this statement. All the meetings of the Congress were open to public attendance, and it is due largely to the great amount of publicity accorded by the Hearst newspapers generally that the invitation to the public to attend met with so general and enthusiastic a response.

The Advisory Committee, whose existence has also been continued, included seventy-nine men representative of the interests of every section of the country, and selected for their standing and influence in their respective communities. There can be no question that the creation of this

Committee was, in a large measure, responsible for the wide attendance of delegates from the most remote parts of the country—from as far away as Hawaii.

Herewith is presented the names of members of the Advisory Committee.

Hon. Don Farnsworth, chairman, general secretary Association of Commerce, Chicago.
 Hon. Joseph M. Brown, governor of Georgia.
 Hon. Allen W. Gilchrist, governor of Florida.
 Hon. Edmond F. Noel, governor of Mississippi.
 Hon. J. Y. Sanders, governor of Louisiana.
 Hon. M. R. Patterson, governor of Tennessee.
 Hon. W. E. Willson, governor of Kentucky.
 Hon. J. N. Gillett, governor of California.
 Hon. Frank W. Benson, governor of Oregon.
 Hon. M. E. Hay, governor of Washington.
 Hon. Edwin L. Norris, governor of Montana, president National Dry Farming Congress.
 Hon. J. H. Brady, governor of Idaho.
 Hon. B. B. Brooks, governor of Wyoming.
 Hon. John F. Shafroth, governor of Colorado.
 Hon. Denver S. Dickerson, governor of Nevada.
 Hon. Wm. Spry, governor of Utah.
 Hon. Reed Smoot, United States Senator, Utah.
 Hon. Geo. Curry, governor of New Mexico.
 Hon. Richard E. Sloan, governor of Arizona.
 Hon. John Burke, governor of North Dakota.
 Hon. R. S. Vessey, governor of South Dakota.
 Hon. A. C. Shallenberger, governor of Nebraska.
 Hon. T. B. Marshall, governor of Indiana.
 Hon. W. F. Frear, governor of Hawaii.
 Hon. Thomas F. Walsh, president Camp Bird Mines, Colorado.
 Hon. Edmund T. Perkins, engineer U. S. Reclamation Service.
 Hon. Daniel J. Keefe, U. S. Commissioner-General of Immigration.
 Hon. Charles P. Neill, U. S. Commissioner of Labor.
 Hon. Henry T. Rainey, Member of Congress, Illinois.
 Hon. H. Steenerson, Member of Congress, Minnesota.
 Hon. Chas. H. Weisse, Member of Congress, Wisconsin.
 Hon. James T. Lloyd, Member of Congress, Missouri.
 Hon. J. M. Cox, Member of Congress, Ohio.
 Hon. W. E. Cox, Member of Congress, Indiana.
 Hon. Duncan E. McKinlay, Member of Congress, California.
 Hon. Wm. F. Engelbright, Member of Congress, California.
 Hon. Sylvester C. Smith, Member of Congress, California.
 Hon. Julius Kahn, Member of Congress, California.
 Hon. Rufus P. Jennings, chairman California Promotion Commission.
 Hon. A. D. Campbell, Commissioner of Immigration, Wisconsin.
 Hon. Lafayette L. Coffman, State Land Commissioner, Arkansas.
 Hon. John Thompson, Commissioner of Agriculture, Tennessee.
 Hon. Ed. R. Kone, Commissioner of Agriculture, Texas.
 Hon. Huntley Russell, State Land Commissioner, Michigan.
 Hon. John T. Burns, secretary-treasurer National Dry Farming Congress.
 Hon. E. J. Watson, Commissioner of Agriculture, South Carolina; vice-president National Irrigation Congress.
 Hon. George W. Koiner, Commissioner of Agriculture, Virginia.
 Fred W. Fleming, vice-president National Irrigation Congress.
 Arthur Hooker, secretary National Irrigation Congress.
 Hon. Geo. E. Barstow, ex-president National Irrigation Congress.
 F. A. Delano, president Washash Railway.
 J. T. Harahan, president Illinois Central Railway.
 H. R. McCullough, first vice-president C. & N. W. Railway.
 Daniel Willard, second vice-president C. & N. W. Railway.
 E. O. McCormick, assistant traffic director U. P. and S. P. Ry.
 Frederick Wann, traffic manager S. P. L. A. & S. L. Railway.
 W. J. Black, P. T. Manager Santa Fe.
 John Sebastian, P. T. M., C., R. I. & P.
 E. L. Lomax, general passenger agent U. P. Railway.
 S. G. Hatch, general passenger agent Illinois Central Railway.
 F. A. Wadleigh, assistant general passenger agent D. & R. G. Ry.
 C. L. Seagraves, general colonization agent Santa Fe System.
 G. B. Haynes, general immigration agent C., M. & St. P.
 M. V. Richards, land and ind. agent Southern Railway.
 Capt. John F. Merry, general immigration agent Illinois Central Ry.
 H. N. Sager, Board of Trade, Chicago.
 W. H. Bush, president Bush Hat Co.
 Wm. N. Jarnagin, assistant cashier-Hamilton National Bank.
 Col. Harry Weisinger, vice-president Columbia Trust Co., Kentucky.
 Hon. George A. Mebane, cotton manufacturer, North Carolina.
 Hon. Robert Ewing, proprietor New Orleans Daily States and Shreveport Times.
 Hon. Edward Wisner, owner Wisner Plantations, Louisiana.
 John Richey, Allison-Richey Co., Texas.
 Roscoe R. Moody, banker, Massachusetts.
 A. M. Lawrence, publisher Chicago Examiner.
 W. P. Leech, publisher Chicago American.
 Dent H. Robert, publisher San Francisco Examiner.
 M. F. Ihmsen, publisher Los Angeles Examiner.
 C. A. Walsh, Hearst Service, secretary.

The headquarters of the Congress were located at the

new Hotel La Salle, all the sessions being held in the beautiful Louis XV ballroom on the nineteenth floor. Simultaneously with the sessions held in the ballroom, interesting Stereopticon and Kinetograph Lectures were delivered for the benefit of the public upon various topics and sections of the country of present-day agricultural importance, by experts in their chosen fields, including representatives of the United States Reclamation Service, Representatives of State Governments, of Commercial Organizations and of Agricultural Associations.

The personnel of the Executive Committee is as follows:

Don Farnsworth, Chairman.	W. H. Bush.
C. A. Walsh, Secretary.	John Sebastian.
C. F. Dick, Ass't Secretary.	S. G. Hatch.
Edmund T. Perkins.	W. J. Black.
H. N. Sager.	G. B. Haynes.
F. A. Delano.	A. D. Campbell.
J. T. Harahan.	A. M. Lawrence.
E. O. McCormick.	Wm. N. Jarnagin.
C. B. Schmidt.	H. R. McCullough.
C. L. Seagraves.	C. G. Hall.

That the Congress did not degenerate into a mere "talk-fest" is a matter for sincere congratulation. The men active in its affairs did not permit to escape, unutilized, the opportunity to lay the groundwork for the successful carrying out of its plans in the future. In response to a strong current of feeling among the Delegates which was early made manifest, a resolution was offered and passed, creating a "Committee upon Resolutions," consisting of Governor Vessey of South Dakota, Chairman; Governor Bryant B. Brooks of Wyoming; Ex-Governors Broward of Florida and Adams of Colorado; Congressman Steenerson of Minnesota; State Commissioners Clarence E. Edwards of California; Huntley Russell of Michigan; Norman D. Harris of New Jersey; H. B. Hening, Secretary of the New Mexico Bureau of Immigration; Hon. Edward Wisner of Louisiana, and Dr. Howard S. Taylor of Illinois. A number of resolutions were introduced by delegates-at-large and referred to this Committee, while others had their origin within the Committee itself. The resolutions as finally presented in the congress at its last session, and carried by a unanimous vote by the delegates, follow:

"Your Committee upon Resolutions begs leave to report that the following resolutions presented by various delegates have been carefully considered by your committee, and their adoption by the Congress is unanimously recommended," viz:

Resolution by Secretary Walsh:

WHEREAS, There can be no work of greater benefit to the people of the United States than this work of promotion of American farm home building, the bringing in to productiveness of all lands available for farming purposes, and the increase of that spirit among the people, tending to remove our crowded population from the cities to settlement upon the land; and

WHEREAS, This first Congress, devoted solely to such purposes, has magnificently demonstrated, not only its own usefulness, but the feasibility and desirability of continuing and perpetuating its work, broadening and extending its scope to the uttermost.

Therefore, be it resolved that the Delegates here assembled express their thanks to the Officers and Committees of this Congress, to the participants upon its program, to the officials of the Federal and State Governments, to the Commercial Organizations, to the "Hearst" Newspapers, Publications and Telegraphic News Service, to the Railroad, and all other, interests assisting in the promotion thereof; and

Be it further resolved, that the present Advisory Committee be continued in office, and that it be requested and authorized through its chairman to appoint a Conference Committee, composed of this Advisory Committee, the Commissioner of Public Lands of the United States, the Governor of each State or his Representative, the Commissioner of Land of each State, or other State officers concerned with the lands, immigration or agriculture in the state, the Presidents of the important Railroad Companies, the Presidents of the National Farmers' Organizations, and the Presidents of all the News Associations in the United States, and the Officials of the Chicago Association of Commerce, with such others as the chairman of the Advisory Committee may deem advisable and that this Conference Committee be called together upon some date during the ensuing winter, that may be fixed by the Chairman of the Advisory Committee to consult together and formulate plans to continue the work of this Congress.

Resolution by Judge E. A. Chamberlain of South Dakota:

WHEREAS, One of the chief functions of this Congress is to collect and disseminate among the people accurate, impartial and practical information concerning vacant cultivable lands in all our States and Territories; and

WHEREAS, To accomplish such purpose it is necessary for this Congress to create an agency suitable for that end;

Therefore be it resolved, that this Congress hereby designates and appoints the Governor of each State and Territory of the United States a member of the Commission, to be known as the, "Central Board of Publicity of the National Farm Land Congress," each of said Governors to act in person, or through a representative of his appointment.

Be it resolved, that the President and Secretary of this Congress be directed at once to communicate this action to each of said Governors, and upon notification of acceptance of such appointment to

enroll the name of such Governor or of his representative, as an accepted member of said "Central Board of Publicity," to serve until the next session of this Congress.

Resolved, That the President and Secretary of this Congress be, ex-officio, members of said Board of Publicity, and that the headquarters of said board be located in the city of Chicago.

Resolved, further, That the Legislators of the several States be respectfully invited to make a reasonable appropriation for the necessary expenses of their respective State representatives on said "Board of Publicity."

Resolution by Congressman Steenerson of Minnesota:

WHEREAS, This Congress fully recognizes the recent rapid advances of farm science, and its great value, not only to our farmers, but to our entire population; and

WHEREAS, The signal advantage already obtained through the scientific study of soil and products, strongly invite to a still more vigorous and systematic instruction in scientific agriculture.

Therefore be it resolved, That we earnestly request the Congress of the United States and the Legislature of the several States to co-operate in providing funds with which to establish Agriculture High Schools in each congressional district and territory in the United States.

Resolution by Mr. E. F. Bohm, of Cleveland, Ohio:

Resolved, That this Congress recognizes fully the importance of the splendid and increasingly valuable work of the United States Geological Survey, and of the Soil Surveys prosecuted by the Federal Department of Agriculture and by the several States, and that it earnestly urges a vigorous continuance of this work so essential to intelligent classification and settlement of the farm lands of the Nation.

Resolution by Mr. R. E. Dowdell of South Dakota:

WHEREAS, The prime purpose of this Congress is to aid in providing homes on the land for those now homeless; therefore

We recommend to the legislators of the various states the enactment of a progressive land tax law to the end that small land holders may be encouraged and excessive holdings discouraged.

Resolution by Huntley Russell of Michigan:

Resolved, That we also urge immediate and vigorous co-operation between the Federal and State governments in the construction of Water Power and Drainage Works, and the prevention of floods and forest fires.

Resolution by Mr. E. F. Bohm of Cleveland, Ohio:

WHEREAS, Large numbers of persons have been induced to settle upon Lands under Federal Reclamation Projects, upon faith and in expectation that work upon these projects would be completed and water delivered to the settlers within a reasonable period of time; and

WHEREAS, The completion of some of these projects has, for lack of funds, been delayed, with consequent loss and hardship to such settlers, who are forced to face the alternative of continued adversity, or the abandonment of their claims; therefore,

Be it resolved, That this Congress urge upon the Congress of the United States, as a matter of equity rather than of charity, that these settlers be granted speedy and sufficient relief.

Committee resolution:

Resolved, That the press of the entire country be urged to give the widest possible publicity to the proceedings and the literature of this Congress as a matter of interest to all classes of citizens in every section of our country.

The members of the "Conference Committee" created by the adoption of these resolutions will be requested to assemble in Chicago in the near future, probably in January or February, to decide upon plans for a meeting to be held during the ensuing year.

The entertainments tendered by the Chicago *Examiner* were conducted with characteristic hospitality, and upon a lavish scale. The banquet at the Hotel La Salle on the evening of November 19th was attended by approximately 500 delegates, who were regaled by as choice a list of after-dinner speakers as has ever assembled in the City of Chicago, with A. M. Lawrence, publisher of the *Examiner*, as host and Howard S. Taylor acting as toastmaster. Another enjoyable event, to which the delegates were bidden, was a theater party at the Majestic, on the evening of November 17th.

The program of the week's session follows:

TUESDAY

OPENING SESSION.

November 16, 10:00 a. m. to 12:30 p. m.

Called to order by Chairman Don Farnsworth of General Committee. Invocation by Rev. Johnston Myers, pastor Immanuel Baptist Church. Announcement of Program Committee and Committee on Rules.

Edwin S. Conway, vice-president Chicago Association of Commerce and vice-president Lakes-to-Gulf Deep Waterway Association, called to the chair.

Welcoming address by Mayor Fred A. Busse of Chicago.

Welcoming address and speech by Governor Charles S. Deneen of Illinois.

Addresses by delegates from the North Central and Eastern Division.

SECOND SESSION.

2:30 p. m. to 5:30 p. m.

Presiding Officer, Mr. Mason B. Starring, president Northwestern Elevated Railroad.

Adoption of report of Committee on Rules.

Address by Mr. F. A. Delano, president Wabash Railway.

Address by Governor A. O. Eberhart of Minnesota.

Address by Governor H. S. Hadley of Missouri.

Addresses by delegates from the North Central and Eastern Division.

WEDNESDAY**FIRST SESSION.**

10:00 a. m. to 12:30 p. m.

Presiding Officer, Hon. John P. Mann, chairman Ways and Means Committee, Chicago Association of Commerce.
Invocation.

Address by Hon. Willet M. Hays, Assistant Secretary of Agriculture of the United States, personal representative of Hon. James S. Wilson, Secretary of Agriculture. Subject, "What the Department of Agriculture is Doing."

Address by Governor R. S. Vessey of South Dakota. Subject, "The Call of the Farm."

Address by Hon. James T. Lloyd, Member of Congress from Missouri, and chairman Democratic Congressional Committee.

Addresses by delegates from the Northwestern Division.

SECOND SESSION.

2:30 p. m. to 5:30 p. m.

Presiding Officer, Hon. D. A. Campbell, postmaster of Chicago.

Address by U. S. Senator William E. Borah of Idaho.

Address by Hon. Frank Mondell, chairman Committee on Public Lands, House of Representatives, Member of Congress at large from Wyoming, author of the Mondell Act; president National Dry Farming Congress. Subject, "Opportunities in the West Under Irrigation and Dry Farming."

Address by Prof. H. W. Campbell of Nebraska, "Father of Dry Farming."

Addresses by delegates from the Northwestern Division.

THURSDAY**FIRST SESSION.**

10:00 a. m. to 12:30 a. m.

Presiding Officer, Hon. M. P. Buel of Evans, Snider, Buel & Co. Invocation.

Address by Prof. George H. Mead, University of Chicago, special commissioner of Governor W. F. Frear of Hawaii.

Address by Mr. Arthur Hooker, secretary National Irrigation Congress, representing Hon. B. A. Fowler, president National Irrigation Congress.

Address by Howard H. Gross, secretary Farmers' Good Roads League, and late representative of President Roosevelt at Paris International Conference.

Addresses by delegates from the Western and Southwestern Division.

SECOND SESSION.

2:30 p. m. to 5:30 p. m.

Presiding Officer, Dr. James Whitney Hall.

Address by U. S. Senator Thomas P. Gore of Oklahoma.

Address by Hon. W. C. Gilbreath, special commissioner of Governor John Burke of North Dakota.

Address by Prof. Clarence E. Edwards, special commissioner of Governor J. N. Gillett of California.

Addresses by delegates from the Western and Southwestern Division.

THIRD SESSION.

7:30 p. m. to 10:30 p. m.

Presiding Officer, Alfred R. Urion, president Chicago Board of Education.

Address by John Henry Smith, special commissioner of Governor William Spry of Utah.

Address by Hon. Joseph M. Carey, ex-U. S. Senator from Wyoming, and author of the Carey Act.

Address by Governor George Curry of New Mexico.

Addresses by delegates from the Western and Southwestern Division.

FRIDAY**FIRST SESSION.**

10:00 a. m. to 12:30 p. m.

Presiding Officer, Hon. J. C. Vaughan, president Vaughan Seed Co.

Invocation, Rabbi Emanuel Hirsch, of Sinai Temple.

Address by Governor Bryant B. Brooks of Wyoming.

Address by Hon. E. J. Watson, State Commissioner of Agriculture, Commerce and Industries for South Carolina, and vice-president National Irrigation Congress.

Addresses by delegates from Southern and Southeastern Division.

SECOND SESSION.

2:30 p. m. to 5:30 p. m.

Presiding Officer, Hon. John A. Bonnell, president Chicago Board of Trade.

Address by ex-Governor N. B. Broward of Florida, "The Reclaimer of the Everglades."

Address by Hon. Edward Wisner of Louisiana. Subject, "Drainage Lands."

Addresses by delegates from Southern and Southeastern Division.

At the morning and afternoon sessions of this day speakers representing the states of the Southern and Southeastern Division addressed the Congress.

SATURDAY**FIRST SESSION.**

10:30 a. m. to 12:30 p. m.

Presiding Officer, Hon. Fred Upham, chairman Board of Review and member Republican National Committee.

Invocation.

Address by Hon. W. K. Kavanaugh, president Lakes-to-Gulf Deep Waterway Association.

Address by Hon. Cato Sells of Texas.

Address by Mr. George Charters, representative California Fruit Growers' Exchange.

Address by Rev. Julius E. De Vos, Director of Colonization for Belgian and Holland Priests and organizer of The National Catholic Colonization Society of the U. S. A.

SECOND SESSION.

2:30 p. m. to 5:30 p. m.

Ladies Specially Invited.

Presiding Officer, Hon. George E. Roberts, president Commercial National Bank, and former Secretary U. S. Treasury.

Address by U. S. Senator Joseph M. Dixon of Montana.

Address by Mrs. J. S. Mayhugh of Nevada.

Address by Mrs. Laura Dainty Pelham, president Chicago City Gardens Association.

Address by Mrs. Charles D. Greenfield, member of governor's delegation from Idaho.

THIRD SESSION.

7:30 p. m. to 10:30 p. m.

Address by Samuel H. Lea, state engineer for South Dakota.

Address by personal representative of Hon. Beverly T. Galloway, chief Bureau of Plant Industry, U. S. Department of Agriculture.

Address by personal representative of Hon. C. J. Blanchard, statistician U. S. Reclamation Service.

Address by personal representative of Hon. Milton Whitney, chief Bureau of Soils, U. S. Department of Agriculture.

SOPHUS RICHARD.

We show in this issue a half-tone portrait of Mr. Sophus Richard, general manager and treasurer of the French Land and Irrigation Company, a corporation with a capital stock of \$300,000, which is developing large areas under irrigation, near French, Colfax County, New Mexico.

Mr. Richard has been very successful in all his operations, and the company has now 25,000 acres under irrigation, and work has been commenced on a second 25,000 acre tract, which will be put on the market at once. Wonderful results have been obtained by farmers on the first tract.

POWER APPLIED DIRECTLY TO WATER.

A small boy and a hose are usually good companions in the summer time, and if, in watching this combination at play, you have ever noticed the boy pick up the hose a few feet from its end and whirl it around on a level just above his head, you are conscious that the water slowly running from it is whirled out with considerable force, thus creating a vacuum within the hose. It is on this principle that the new Centrifugal pump (patented) for irrigation purposes, described in this article, works, the water being raised by the same force that causes a flywheel to burst into pieces when revolved too rapidly.

The most interesting and revolutionary feature of the new pump is in the fact that the power is applied directly to the water, only about three per cent being lost in journal, speed resistance and friction. The pump will draw water at a speed of forty revolutions per minute, and its capacity increases in proportion to the speed of its revolutions.

In the mechanical construction of the pump there are no runners, plungers, stuffing boxes, or piston rods; in fact, nothing but open pipe. From intake to discharge the open pipe constitutes the pump, connecting at the top with the driving shaft which whirls it around. Being hung on ball bearings at the top, the pump seeks its own equilibrium at all times, and hangs without any guide except this one journal at the top. Primed full of water, it runs as freely and easily as a balance wheel until the speed is reached where the water starts moving outward in suction arm. It can be plainly seen that the power is thus applied directly to the water, as up to the point just before the water commences to whirl the resistance is practically nothing.

It is the whirling motion made by the open pipe that causes the water to move from the center to circumference, thereby creating a vacuum in the horizontal pipe. Atmospheric pressure does the rest as in a siphon, power being applied simply to assist natural conditions. When the water is raised to the top it is discharged through the whirling pipes into a continuous trough or tank. These discharge pipes have the effect, so to speak, of running away from the water they discharge, as does the end of the hose whirled by the boy.

The pumps are made with the suction pipe connected to a head which runs on ball bearings with four pipes or arms extending horizontally, which in revolving causes a perfect balance.

A number of these pumps have been installed for irrigation purposes in the Southern and Western States. They raise water about thirty feet.

These pumps are manufactured by the Kewanee Siphon Pump Co., whose advertisement appears in this issue.

Send \$2.50 for The Irrigation
Age one year and
The Primer of Irrigation

Reclamation Notes

CALIFORNIA.

Because of the uncertainties regarding its success, the Interior Department has abandoned the proposed construction of the Walker river reclamation project in California and Nevada.

The Board of Directors of the South San Joaquin Irrigation district recently adopted the report of the chief engineer of the district, and officially declared that \$1,875,000 should be authorized in a bond issue to construct the proposed irrigation and drainage systems.

It is stated that \$6,000,000 is on hand ready for immediate use in the great American river reclamation project just north of Sacramento and that active work will begin next spring. Fifty-five thousand acres now subject to overflow will be surrounded by high levees and will form the richest of agricultural soil.

At a recent meeting between the Irrigated Land Company of California and certain property owners of the Lomo and Terra Buena districts, the matter of rights of way for an irrigation ditch from Sunset to Terra Buena was discussed. When the canal is completed it is expected to irrigate the Stocking and Bryany tracts at Terra Buena, now owned by the Sutter Land Syndicate.

It is reported that San Francisco capitalists have purchased 3,000 acres of land in the western part of Yolo county on the Elmira-Rumsey branch of the Southern Pacific Railroad, and will irrigate by the means of a seven-mile canal that will draw its supply of water from Cache creek, and will have connection with the system of the Yolo county Consolidated Irrigation Company. The company has been incorporated as the Irrigated Valleys Land Company. Wm. J. Metzner is president and Chas. J. Cox, Jr., secretary. The main office of the company is at San Francisco.

The Annadale colony water company of Reedley incorporated recently as a voluntary association to irrigate lands of the colony named C. L. Seagraves, who constructed an irrigating plant. Seagraves will transfer to the corporation as representing the lot owners all his rights to this company formed to manage and regulate the plant for the common use of the lots. The directors are seven, as follows: C. L. Seagraves of Chicago, Ill.; R. L. Starr of Byran, Ohio, and Cyrus Falconer, L. B. Cory, J. O. Steinfeldt, G. C. Shelby and G. W. Murbarger of Wahtoke. The cost of the plant is substantially \$20,800, making the cost per acre \$40; capital stock, \$25,000.

COLORADO.

The Colorado Southern Irrigation Company has filed a paper showing Canon City as the principle place of business.

B. E. Moody, of Rocky Ford, has filed plans for the Moody reservoir and supply ditch to irrigate 6,000 acres in Pueblo and Las Animas counties, at a cost of \$82,000.

The Orchard Mesa Irrigation Company which is constructing an irrigation system between Grand Junction and Palisade plans to complete its work before April 1st, 1910.

Maps have been filed by M. J. Bailey for the Custer reservoir, located in San Miguel and Dolores counties. Water will be taken from Disappointment and Spring creeks. The system will cost \$200,000.

E. B. Rees of Denver filed maps for the Rees Seepage ditch No. 1, which will have a carrying capacity of 196 cubic feet per second, and will irrigate 15,680 acres. The estimated cost of this project is \$40,000.

Maps and specifications for a new reservoir which will irrigate 2,240 acres of land near Grover were filed recently. The reservoir will cost approximately \$30,000. Water will be drawn from the flood, surface and underflow of Crow creek.

It is stated that a new irrigation district in the northern part of Mesa county and the southern part of Garfield county is soon to be formed. A canal planned will be constructed near Rifle and will supply 10,000 acres between Grand valley and De Beque.

At a joint meeting between the Mesa County Irrigation

district and the Palisade Irrigation district recently it was decided to hold an election early in December to vote on the proposed bond issue of \$176,000, for the purpose of building a dam across the Grand river.

The Otero Irrigation District, near La Junta, has voted bonds to the amount of \$100,000 for the purpose of putting its canal in first class condition. An additional \$50,000 has been voted by the district for the purpose of constructing a new reservoir in Anderson arroyo.

C. B. Schley, Bulklet Wells and Duncan Chisholm, of Colorado Springs, have incorporated the San Miguel Development Company, capitalized at \$150,000. The incorporators expect to develop an irrigation project in the territory lying near Norwood, in San Miguel county.

Incorporation papers were filed recently by the Toltec Water User's Association, capitalized at \$200,000. This company proposes to irrigate a large tract of land in Conejos county. The incorporators are Lou D. Sweet, J. B. Monroe and H. R. Trowbridge. The main office of the company is at Antonito.

Farmers and landowners of the Hardscrabble farming district met at Wetmore recently and voted unanimously to organize an irrigation district. The land which will be included in the irrigation district embraces about 20,000 acres and lies one-third in Custer county and two-thirds in Fremont county.

The Great Northern Irrigation & Power Company has applied for the segregation of 144,000 acres of land in Routt county, to be brought under irrigation under the provisions of the Carey act. The company is backed by eastern capitalists and the project will require the expenditure of several millions of dollars.

The Antero Irrigation district, comprising 55,000 acres, immediately north of Denver, was formed recently. All of the lands included can be irrigated, it is said, by the waters from the Antero reservoir through the High Line canal system. This reservoir was recently completed, and has a storage capacity of over 80,000 acre feet.

The Fraser Sources Irrigation & Power Company of Denver has filed an amended map of the Fraser Sources ditch, with the state engineer. It is proposed to dig a tunnel to bring water from the other side of the range into South Boulder canon. The water supply will be taken from several sources in the Fraser river county. The estimated cost is \$1,975,000.

An irrigation project involving the construction of a reservoir and canal system to water 100,000 acres in Prowers county is now in process of formation. The storage reservoir will be located on the Purgatoire, sixty-five miles south of Las Animas, and will have a capacity of 400,000 acre feet. The estimated cost of the system is about \$4,000,000. Two years will be required for construction.

The Laramie-Poudre Irrigation & Reservoir Company has let the contract for the construction of a 12,000-foot tunnel through Green Mountain, by which the waters of the Laramie river will be brought into the Cache la Poudre basin and distributed upon the plains for irrigation of 150,000 acres. The tunnel and power plant to be built in connection therewith will entail an expenditure of approximately \$750,000. The contract specifies that the tunnel must be completed on or before December 1st, 1911. The company owns a large reservoir and ditch system in the district to be served and additional reservoirs are projected. The amount involved in the project is over \$2,000,000.

WYOMING.

The work of building the government's Shoshone dam is now 88 per cent completed, and will probably be finished sometime during December of this year.

Detailed plans of the North Platte Valley Irrigation Company of Douglas indicate that this concern will expend nearly two million dollars in the reclamation of 1,000 acres in the Platte river valley for a distance of 35 miles between Glenn Rock and Orin Junction. Recently the company has secured control of the La Prele Ditch Company which is now constructing a cement dam on La Prele creek. By the construction of a power plant the company, at a cost of \$350,000, will carry electricity to various pumping stations on the La Prele Company's canals and the Platte river. The incorporators of the company are W. F. Hamilton, J. M. Wilson, B. J. Erwin and W. F. Cox. By the expenditure of \$600,000 the company proposes to supply water to 60,000 acres.

IDAHO.

The formal opening of the Kings Hill extension lands near Medbury occurred on November 16th.

The Payette-Idaho Irrigation Company, at Payette, has started work on the reclamation of 4,000 acres near that city.

It is reported that the Big Lost river project in eastern Oregon has placed its bonds and will soon begin active construction work.

Work has again started on the big irrigation canal in Round valley on the east side of Salmon river, and by the 15th of May, 1910, water will be delivered to the land owners direct from Salmon river.

The Crane Creek Water & Power Company has let the contract for the construction of its dam and reservoir to irrigate 20,000 acres near Weiser. It is proposed to have 9,000 acres under water next spring.

The Deep Creek Irrigation project near Hollister is nearly completed. By the expenditure of \$40,000 in a dam and two reservoirs, the company proposes to water 5,000 acres. The project has been financed by local business men at Hollister.

At a recent meeting of the lower Payette Ditch Company near Boise an agreement was entered into with the Payette Heights Irrigation Company, whereby the former company's canal will be enlarged to carry sufficient water for 3,000 acres controlled by the Payette Heights Company.

Land owners in Caldwell and Canyon counties propose the organization of an irrigation district, embracing about 26,000 acres adjoining the Boise-Owyhee Irrigation Company's project. It is claimed that the proposed system may be enlarged to water 70,000 acres. The Idegon Irrigation Company has a segregation of 3,000 acres within the boundaries of the proposed district and it is understood that this company protests against the formation of the district.

Concrete work on the superstructures for the pumping stations on the government's Minidoka irrigation project, was completed during October. The work of raising the spillway for storage purposes is being pushed and excavation on the south side pumping laterals is being continued in small contracts, also the enlargements of the south side gravity canal. The gravity system for this project is completed and 61 per cent of the south side pumping system has been finished.

For the purpose of supplying water to a large area not covered by the Payette-Boise government project, settlers have recently organized an irrigation district with Edward E. Hedden as engineer in charge. Surveys call for the diversion of waters from the Payette river above Horse-Shoe bend and carrying the supply through a tunnel between the Payette and Boise rivers at a point six miles south of Emmett. It is claimed that 40,000 acres will be supplied with water by this system.

It is reported that settlers under the proposed Sunnyside project in Elmore county and the officers of the Southern Idaho Reclamation Company have entered into an agreement on all matters involving the proposed segregation of 67,000 acres, excepting the proposition of water-rights. This problem has been left to the State Land Board. The company asked a rate of \$70, but it is estimated that the board will fix the figure at \$65. By the proposed plan the construction company will allow settlers credit for money paid on water-rights of the Great Western Sugar Beet Company. The construction company further agrees to deliver water on or before April, 1912.

On the Payette-Boise government project in Idaho it has been decided that a water supply can be furnished next year for a certain area, the exact extent of which, however, has not yet been definitely determined. Settlers in several districts of the project which require only the completion of the distributing system have urgently petitioned that they be allowed to do the greater part of the work which consists almost wholly of ordinary earth excavation, and have agreed that they will turn over to the United States for all purposes of the project the ownership and control of this distributing system so far as may be necessary in carrying out the general policy of the service. The Secretary of the Interior has formally approved the plan proposed for extending the irrigable acreage on the project.

Articles of incorporation of the Post Falls Irrigation Company and the Post Falls Land and Water Company have been filed at Coeur d'Alene with an authorized capital of \$700,000. The first company is organized to construct an irrigation system while the second company will dispose of

this land to settlers. Upon finishing its work the stock in the Post Falls Irrigation Company will be divided between the land owners and the land company. Directors of the irrigation company are as follows: Boyd Hamilton, Jas. McLane and Harry McLane, John W. Smead and John S. Malloy. The directors of the Land & Water Company are Boyd Hamilton, Jas. A. McLane, Harry McLane and J. L. Gunsaulus and Ayres D. Lundy. Land to be irrigated includes 3,500 acres near Post Falls and Ross Station at the eastern end of the Spokane valley.

With a capital of \$5,000,000 a company is now being organized in Spokane to develop a power site on the Snake and Salmon rivers in central Idaho, 40 miles south of Grangeville, where A. W. Trine and G. F. La Frenz, of Spokane, have located a dam and site for a power plant. The project involves the boring of a tunnel of seven and a half miles through solid rock. The developing plan calls for a combination tunnel and dam, the latter being 100 feet in height located on the Salmon river, a quarter of a mile from the point where the long tunnel will leave the waterway for the Snake river. R. J. Zell, of Spokane, has been working on the project for two months and the estimates on cost of con-



GEORGE B. FRASER,
Editor Twin Falls, Idaho, News.

struction for the dam and tunnel are nearly all in. The company will also be in position to irrigate several thousand acres of land in central Idaho.

Approximately 544,000 acres of land which were withdrawn in connection with the Dubois irrigation project, Idaho, have been restored to the public domain by the Secretary of the Interior. The area is involved in a segregation of lands to be included in a Carey Act project under the application of the state of Idaho. The restoration covers lands in Townships 5 to 10 North, Ranges 29 to 40 East. This action was taken by the department for the reason that there will not be available from the Reclamation Fund for some years the moneys necessary for the development of the project, and upon the petition of the governor and the State Land Board of the state of Idaho, the Secretary of the Interior decided to withdraw from the project if the state found it practicable to take it up under the Carey Act. The restoration became effective in such a manner as to protect the segregation made upon the request of the state.

NEW MEXICO.

The Donahoo Irrigation Company of Albuquerque is investigating the underground water supply near El Paso with a view to the erection of a pumping plant for the irrigation of about 4,000 acres.

The farmers of the Portales valley have signed a contract with the Western Construction Company, of Wichita, Kans., to put in a \$210,000 electric plant that will supply power for pumping water to irrigate 10,000 acres.

Reports from Santa Fe state that Henry A. Allen & Co., consulting engineers for the Santa Fe Irrigation & Improvement Company, have advised the abandonment of dam No. 1 on the Arroyo Hondo project. The company proposes, however, to construct dams No. 2 and No. 3.

Land owners at Taiban and vicinity are interested in tests now being made for artesian water. It is reported that the supply can be reached at a depth of about 35 feet, and experiments will now be made to learn whether or not this supply is inexhaustible. It is claimed that if results are satisfactory many thousands of acres will be irrigated by this method.

Reports from Portales state that the United States Geological Survey indicate that the supply of underground water available for pumping is limited, and that continued dependence upon the supply will result in disappointment unless steps are taken to discover the source of its waters and arrange for more copious flow. The department is now experimenting and will shortly submit a report stating the manner in which to secure this added supply.

MONTANA.

The government has approved the award of thirteen small contracts for the construction of lateral system known as the Dodson South Unit of the Milk river irrigation project. The contracts amount to approximately \$54,000.

L. M. Hatch, of the firm of Lewis & Hatch at Billings, is reported to be working on preliminary surveys for a new project in the northern part of the state. About 38,000 acres are involved and Mr. Hatch states that if surveys and estimates are satisfactory a company will be organized and will begin work early in the spring.

Ben Kress, W. R. Gray and E. F. Richards have made application for the formation of an irrigation district at Blodgett Creek, near Hamilton. It is to be known as the Blodgett Creek Irrigation District. Because of a shortage of water during August and September it is proposed to construct reservoirs and ditches for use at this season of the year.

Reports from Dillon state that surveyors are at work preparing for an irrigation canal to convey water to the bench lands nine miles north of that city from the Beaver Head river. The supply will come from the Lima reservoir. About 50,000 acres may be brought under water by this project. Surveyors are said to be in the employ of the Beaver Head Range Company.

The irrigation season on the Lower Yellowstone irrigation project, Montana-North Dakota, was practically closed on October 11th when water was turned out of the main canal. A force of over 200 men is employed on the Lower Yellowstone dam which is now 66 per cent complete. Grading on the Northern Pacific extension is still holding a large force of men and teams although the lighter work is nearing completion.

President Hill of the Great Northern Railway has interested himself in conditions on the government's Milk river project. At a recent conference he signified his willingness to head a delegation to Washington for the purpose of adjusting matters in dispute and securing the early resumption of operations. L. Newman, president of the Milk River United Association, is now planning for this action. Preliminary meetings are being held.

OREGON.

A petition is being circulated at Nyassa and Ontario for the organization of an irrigation district. The proposed district comprises about 135,000 acres of land.

Surveyors, said to be in the employ of Salt Lake capitalists, have been at work making surveys in Surprise valley. About 60,000 acres of land can be brought under cultivation by the proposed canal.

Petitions are in circulation for the formation of an irrigation district to comprise a portion of the lands included in the former proposed Malheur government project. These lands lie south of the Malheur river and north of the Nevada

ditch. It is claimed that if the district is formed capital can be interested for construction work.

F. S. Reider, of the Willamette Valley and Cascade Mountain wagon road land grant, has been conferring with local land owners in the McKay flat country, and will attempt to amalgamate the two interests already organized, for the construction of canals from the Ochoco river to utilize flood water for irrigating the bench lands east and north of Prineville. It is stated that he will also interest capital in a plan to reclaim about 15,000 acres.

WASHINGTON.

The Union Gap Irrigation Company will increase the capacity of its present canal and will construct a large power plant.

A gasoline drilling outfit has been installed on the W. W. Robinson ranch five miles north of Ellensburg, to drill from ten to twenty wells on 400 acres of orchard land.

Reports from Chelan state that a movement is on foot to irrigate the Howard flat country. The present plan is to form a company, bond the land and pump water from the Chelan river.

The Lower Yakima Irrigation Company, which now has 16,000 acres under gravity system at Richland, will soon begin improvements costing approximately \$75,000. The system will be extended to bring an additional 5,000 acres under irrigation.

Articles of incorporation were filed recently by the Klickitat & Simcoe Irrigation Company, capitalization, \$250,000. This company will eventually water 10,000 acres of high bench land, diverting its supply from the Klickitat river and carrying it twenty miles.

Farmers owning land under the Cascade canal in the Ellensburg district will spend \$300,000 in improving the works to irrigate 10,000 acres of land. The project calls for a tunnel from Dry creek through the hills for more than two miles to a point near Indian lake.

Work on the canyon division of the Tieton project is rapidly nearing completion. Up at Bumping Lake, the river is now being diverted through the outlet works and the river section is being coffer-dammed and excavated. A force of 150 men are at work on this section.

Preliminary surveys are being made by a consulting engineer of the United States Reclamation Service for the irrigation of the Quincy county portion of the Big Bend district. Approximately 500,000 acres will be watered at an estimated cost of several millions of dollars.

The Okanogan irrigation project in northern Washington is now 96.5 per cent completed, and the Conconully dam 84.2. The entire flow of the south and west forks of Salmon river has been turned into two small reservoirs at night and utilized in the day time to operate hydraulic giants for the purpose of sluicing material into the big dam.

UTAH.

The Newcastle Reclamation Company has filed application for ten cubic feet of water from Big Creek in Washington county to irrigate 4,500 acres.

Land owners have applied for water rights from Boulder Creek, a tributary of Provo river, for the purpose of irrigating about 2,300 acres near Kamas. The stream will be dammed.

The Blue Ranch Canal & Reservoir Company of Theodore has filed application with the state engineer for 24 second feet of water from Rock creek, with which to irrigate 1,440 acres.

Eugene Trimble, Geo. A. Snow, J. A. Melville and Prof. Mead and Prof. Ione were in Huntington recently looking over the Buck Horn Flats proposition, where they contemplate the construction of an irrigation system to reclaim 30,000 acres.

F. H. Lott, J. P. Smith and Geo. C. Jones, of Denver, and Wm. H. Smart, of Vernal, have filed an application for the segregation of about 31,000 acres in the Salt Lake and Vernal districts. Their plans include the construction of a 30-mile canal to supply water to lands in the old Uintah reservation. The same company has applied for right to divert 500 second feet of water from the Duchesne river at a point near Myton. The company is capitalized at \$1,000,000.

MISCELLANEOUS.

W. Y. Price and C. G. Powell of Florence, Ariz., have purchased 1,000 acres of land near that place and will install a large pumping plant.

The United Irrigation & Rice Milling Company, of Crowley, La., will extend its canals about 25 miles, making 10,000 additional acres available for rice cultivation.

The Gila Water Company, of Phoenix, Ariz., has let the contract for the construction of a concrete dam at an approximate cost of \$100,000. This dam will be used to store water for 80,000 acres.

The Kinder Canal Company, of Lake Charles, La., has purchased the property of the Calcasieu River Irrigation Company and will enlarge the pumping plant and extend the canals at a cost of \$15,000.

The Allis-Chalmers Company has been awarded the contract for nine transformers for the use of the government in its pumping work on the Salt river, Arizona, project. The contract amounts to \$8,100.

An irrigation project to cost \$25,000,000 is proposed in Argentina, the principal railways to do the work, and be paid by the government in 5 per cent irrigation bonds, with the water rental to take care of the bonds.

It is reported that Chas. W. Swenson, of Chicago, has purchased the properties of the Toyah Valley Irrigation Company. The purchase includes the townsite of Belmore, and the consideration is said to be \$375,000.

Former State Senator D. P. Marum of Woodward, Okla., has made application to the State Board of Agriculture for water rights from the North Canadian river to irrigate 20,000 acres of land adjoining the town of Woodward.

About 59,000 cubic yards of material were placed in the Belle Fourche dam, South Dakota, during October. The dam when finished will create the largest lake in South Dakota. Water in the canals was turned off the first of the month and the ditches are being repaired.

Up to the first of November the bore of the Strawberry tunnel, at the government Strawberry valley project in Utah,

was in 4,774 feet, 391 feet of which were excavated in October. During that month the material encountered varied from a fine to a coarse grained limestone mixed with sandstone.

Capitalists of Goldfield, Nevada, have filed a petition in the United States land office at Carson City for the withdrawal of 200,000 acres of land in the Las-Vegas country, in Clark county, under the Carey act. They intend to irrigate by means of artesian wells. This work will require an expenditure of approximately \$4,000,000.

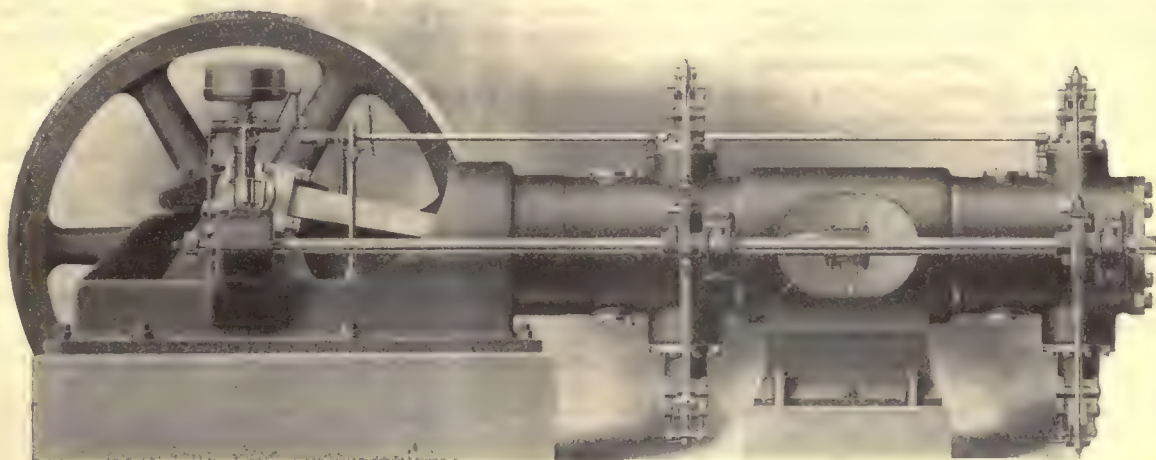
Messages received by the chief engineer of the Yuma irrigation project, from Washington, recently authorized the immediate resumption of the government work which has been in abeyance. It is definitely stated that the project, which is now 70 per cent completed, will be finished without delay, and that by November, 1910, 30,000 acres will be under water.

The Secretary of the Interior has awarded contract to the Byron Jackson Iron Works of San Francisco, Cal., for furnishing nine centrifugal pump units for use in connection with the Salt river irrigation project. These pumps are to be used to raise underground water for irrigation purposes, and will be operated by power developed at the Roosevelt dam and transmitted electrically nearly 100 miles to the pumping stations.

The force on the Garden City irrigation project, Kansas, has been kept busy overhauling the machinery and getting the boilers, turbines, and pumps in readiness for winter. During the irrigation season, which closed September 30, the pumping plant was operated 95 days and 7 hours. About 7,500 acre-feet of water were pumped, which irrigated 6,456 acres, while 9,300 acres were irrigated by river water. The total rainfall during the irrigation season was 13.77 inches.

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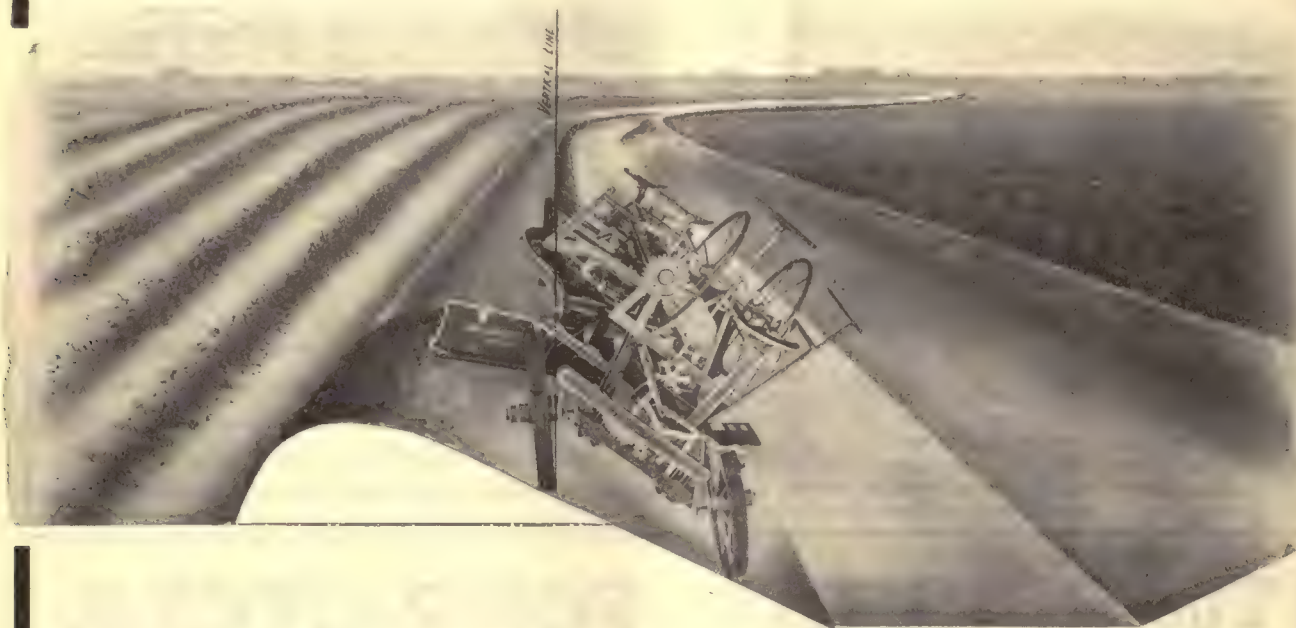
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SPOKANE VALLEY COMPANY FORMED.

Spokane Valley Irrigated Land Company, controlling 20,000 acres of fruit land, valued at \$10,000,000, in the valley east of Spokane, has been incorporated with a capital of \$50,000, paid in, by the amalgamation of the interests represented by Neely & Young, Becher & Thompson and E. G. Taylor, secretary of the Spokane Canal Company. The merger includes Greenacres, Otis Orchards, West Farms, Opportunity, East Farms, East Greenacres, Pasadena Park, and 2,000 acres of unplanted land. The acreage is under irrigation, water being supplied by the Corbin ditch, Fish lake and Liberty lake canals and a pumping system. The officers of the company are: President, D. M. Thompson; vice-president, E. G. Taylor; secretary, Harry J. Neely, and treasurer, C. F. Young, with headquarters in the Greenough building.

The first move will be to exploit the land through the east and middle west in an endeavor to interest eastern people in the irrigated projects in the Spokane valley. The company expects to have a greater part of the valley settled at the close of next year. Five thousand acres will be thrown open for settlement the coming season. Neely & Young, Becher & Thompson and E. G. Taylor have been handling dry and irrigated lands in Washington and Idaho for a number of years and together have made sales aggregating \$15,000,000.

KANSAS CITY FIRM WINS OUT.

Jury of Awards of Seattle Worlds Fair Upholds Highest Award of Medal to Witte Engines.

As noted some time ago in the news dispatches, the Jury of Awards at the Alaska-Yukon-Pacific Exposition awarded to the Witte Iron Works Co. of Kansas City, Mo., through their representatives, the Moran Engineering Co. of Seattle, Wash., the Medal of Highest Award on Witte Stationary Gasoline Engines.

Shortly after the award was made a protest was filed by some of the competing exhibitors (of whom there were a large number), claiming in effect that the award had been placed without due consideration of everything involved.

The Superior Jury of Awards (the final authority on all appeals and protests in the placing of awards) at once ordered, by a Special Jury, a re-examination and a reconsideration of the whole matter, with the result as shown by the following letter to the duly authorized representatives of the Witte Iron Works Co.:

Seattle, Wash., Oct. 16, 1909.

Moran Engineering Co.,
Seattle, Wash.

Gentlemen:—I beg to inform you that the Special Jury on Awards selected by ourselves and approved by the Superior Jury, after re-examination of all the Gasoline Engine Exhibits, sustained the awards given by the original examining jury to you.

Very truly yours,

HENRY E. DOSCH,
Director of Exhibits and Privileges.

This result must be gratifying to the Witte Iron Works Co. It is a recognition of note in these columns, and we are pleased to extend our congratulations to the company on the success won by their merit in this competition.

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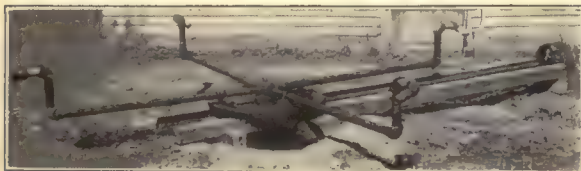
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(Continued from page 83.)

enables him to remedy the defects in his land by the application of substances it needs, and, what is equally of value, it enables him to avoid adding to the soil what he knows it already contains, and will put him upon the search for substances it does need. Moreover, an analysis will indicate to the farmer whether a certain soil is capable or not of producing a good, profitable crop of certain plants, and save him from losing his time, labor, and money planting a crop which can not grow to perfection because of some defect in plant food necessary to plant life. In other words, the farmer will know what to do with his land without guessing, or trying expensive experiments. This is not "Book farming," it is common sense.



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In his annual report of conditions in the Department of the Interior, Secretary Ballinger makes numerous observations and recommendations in relation to the projected work on the reclamation of arid lands, chief among which is his declaration that prospective funds to be derived from the sale of lands and water rights will be inadequate to actively pursue projected work. To relieve the situation he suggests a bond issue of \$30,000,000 to be negotiated in blocks, under the direction of his department, as needed for the early completion of projects now partly finished.

Under the act of 1902 it is required that the Government expend a certain amount of the money obtained from the sale of lands, on reclamation projects within the state wherein such sales were made. Through the additional funds to be gained from the bond issue it is proposed to comply with this requirement and give to those states the work heretofore denied them because of the necessity for heavy expenditures to complete projects in other states.

Among other amendments, an amendment to permit the assignment of homestead entries, within projects, after entrymen have completed five years' residence and cultivation and made proof thereof, is recommended.

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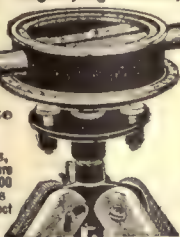
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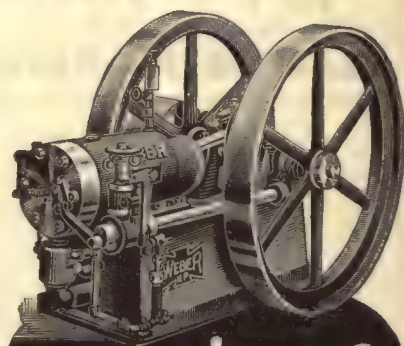
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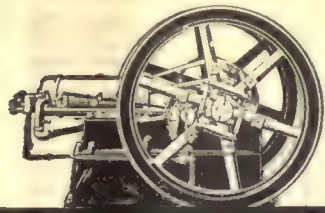
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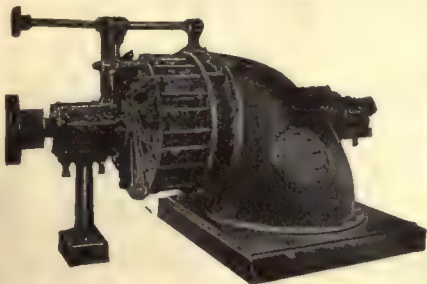
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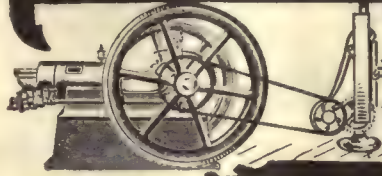


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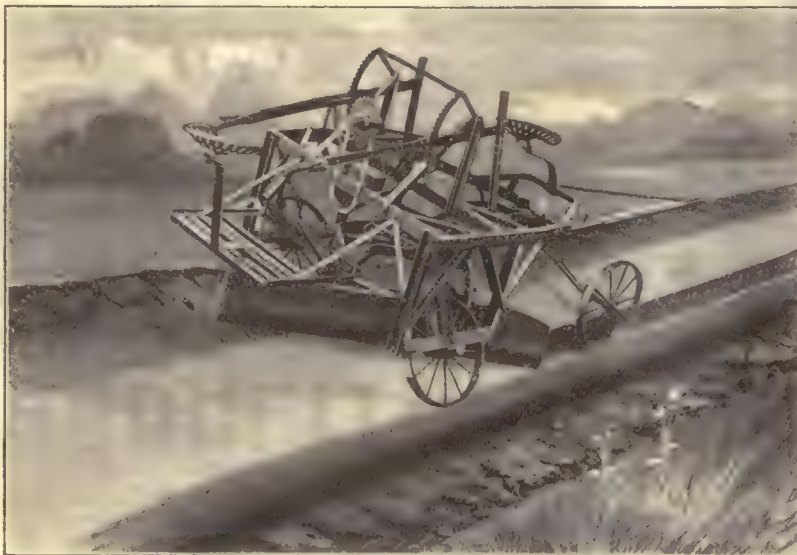
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It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

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SALT RIVER PROJECT.

The progress report of the supervising engineer of the Salt river project states that the contractors are making rapid progress on the great Roosevelt dam. The elevation of the highest point of the dam is 211 feet. As soon as the water ceases to flow on the dam the work of closing the gap between the ends will be begun. The work of sinking wells on the Gila reservation is being carried on and similar work is progressing in the Mesa district with satisfactory results.

Andrew Weiss, project engineer, has filed a petition with the state engineer of Nebraska, together with an application for an extension of time, in which to complete the work on the North Platte irrigation project of the government. Five more years will be required to complete it, and it may be ten years before all the available water can be turned over to the farmers. The application has been granted with two provisions: First, that water be placed on the land as fast as possible; second, that settlers who are now irrigating their land from adjacent streams shall retain their rights.

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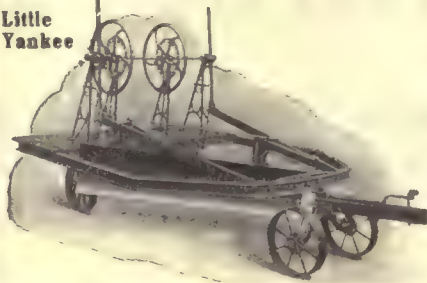
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Jerks are the worst enemy of motoring. Jerks eat up tires, devour gasoline and oil, and shake your car into the repair shop.

All makers know that. Some of them have acknowledged it by using heavy flywheels. But heavy flywheels only lessen the shock of each jerk and do not cure the jerk itself.

Like giving the baby a sleeping opiate (so he'll not feel the pain) without doing one solitary thing to remove the cause of the pain.

Jerks in a motor car are due to the power-strokes of the piston.

The carpenter comes and tears out every fifth step.

That leaves four steps and a gap, four more steps and a gap, four more steps and another gap.

In climbing those stairs, you have to jump every fifth step, don't you?

That's practically what every four-cylinder motor has to do driving its car.

For every four-cylinder motor produces power only *four-fifths* the time and has to jump the one-fifth gap before it produces power again.

And it makes absolutely no difference how fast the motor turns over, or how many flywheels it may have.

Six-cylinder motors produce power *six-fifths* the time.

Thus in the Six, power in each cylinder always *overlaps* power in each preceding cylinder one-fifth the time.

The result is **Continuous Power**.

The Six produces more than enough power to fill the gap.

So, there is never an instant of "no power" in the Six.

And there is *never* a jerk in the Six, because there is no gap.

A 48 horse-power, single-cylinder car jerks itself along under 28,800 pound power-strokes—28,800 pound jerks.

A 48 horse-power, four-cylinder car jerks along under four times as many jerks, each jerk having 7200 pounds behind it—7200 pound jerks.

But the Six-Cylinder car (no matter how great its horse-power) doesn't jerk at all, because it has **Continuous Power**.

Mark this: The Six is the only gasoline car that has **Continuous Power**.

No motor car can have Continuous Power unless it has **Six Cylinders**.

Continuous Power and Six Cylinders are inseparable.

At home you have a flight of stairs.

If all the steps were replaced, you could ascend and descend your stairs without acrobatics.

So, if a motor could only produce power all the time, it wouldn't be necessary to resort to futile flywheel acrobatics.

And as your acrobatics do not replace the missing steps, so neither do flywheel acrobatics supply the missing power.

One-cylinder motors produce power *one-fifth* the time.

Four-cylinder motors produce power *four-fifths* the time.

Because it has a stream of **Continuous Power**, without ever a jerk, the Six is the smoothest, sweetest-running motor in the world.

Continuous Power saves tires and repair bills. Twenty Winton Sixes traveled 184,190 miles (more than seven times around the earth) on total repair expenses of \$142.48.

That averages 77 cents per 1000 miles.

What was your average, Mr. Owner, on jerky power?

Continuous Power does more work than jerky power. That's why the Six motor will drive its car, on high gear, at a motor speed so slow that, if attempted on a four, the motor would stall.

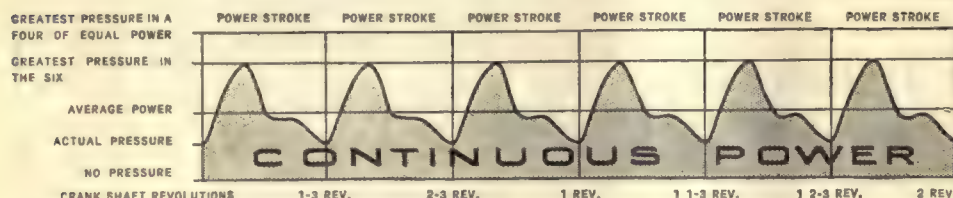
Since the Six motor will do this, the higher speeds of the Six motor represent **Reserve Power**.

This **Reserve Power** makes the Six the best hill-climber there is.

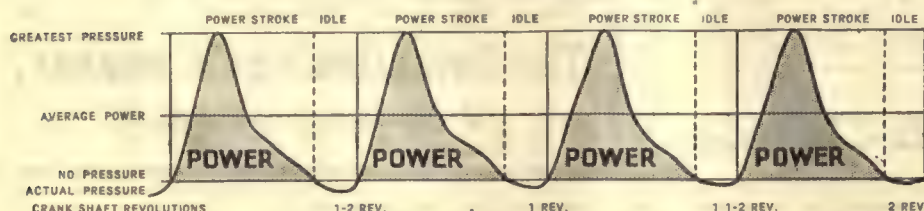
Ability to run on high gear at extremely slow motor-speed, reduces the necessity of gear-shifting in traffic and on hills. That means **Flexibility**.

Flexibility means **Economy**. Everybody knows the economy of continuous use of the high gear, and the wastefulness of low gears.

The Application of Power in the Six-Cylinder Motor



The Application of Power in the Four-Cylinder Motor



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Power

Continuous Power enables a car to "pick up" and get away faster than is possible with jerky power. The Six gets through crowded traffic at a great saving of time and patience.

See the Power Diagram.

Note the four-cylinder gaps of **No Power**. (Marked "Idle.")

Note the continuous, unbroken power-stream of the Six.

That's the chief reason why there are Six-Cylinder cars on the market.

The Six remedies fundamental faults of all previous types.

Because that is true, the Winton Company is now making **Sixes exclusively** for the third successive season.

It is a matter of conscience with us. We haven't the hardihood to make an outclassed type of car.

Six-Cylinder Advantages ought to apply to all Sixes—because the differences are fundamental and reach back to basic principles.

But since some makers now producing sixes, continue to make old-style types also, we can only conclude that their sixes have not convinced them—the makers.

If a maker isn't himself convinced by his own product, he is, to say the least, ill-equipped to convince you.

So we suggest that you look for Six Superiority in the Winton Six, the car that is able to show that Superiority.

Furthermore, there are numerous exclusive advantages in owning a Winton Six.

The Winton Six motor starts from the seat without cranking. This feature, not found on any other car of any other make, is a feature worth the price of one's self-respect.

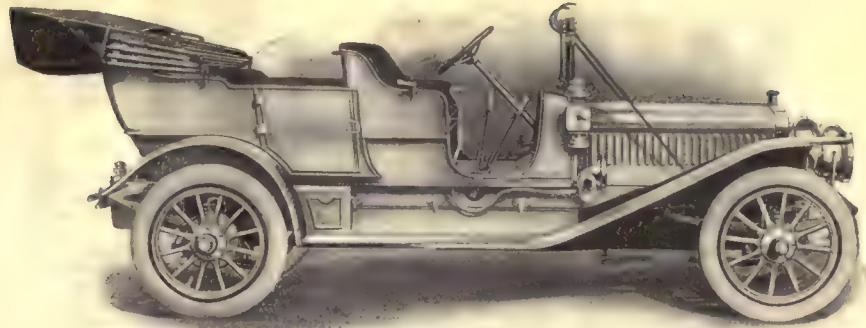
The same pressure that cranks the motor also inflates your tires.

The Winton Six motor for 1910 is identically the same motor we used for 1909. **It needed no improvement.**

The Winton Six motor is completely housed—not a single working part exposed to dust and dirt. No wonder Winton Six motors seem to run forever without trouble.

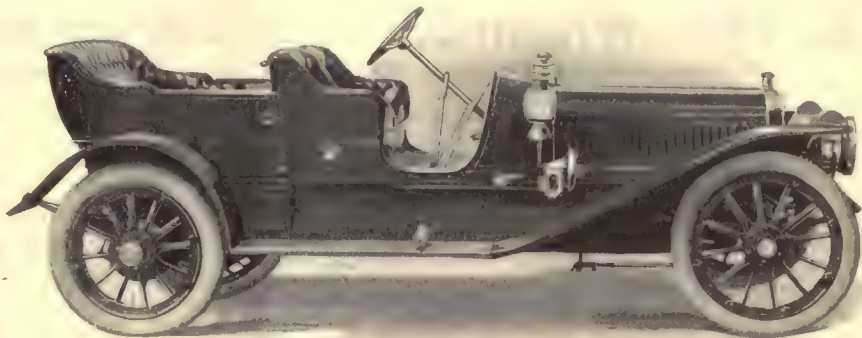
The 1910 Winton Six buyer gets four forward speeds, a large diameter multiple-disc clutch, the best carburetor we have ever seen, dual ignition, a superb, roomy body, suspended low on semi-elliptical springs, 124-inch wheel-base (four inches more than last year), and an inswep frame, allowing short turning radius.

At \$3000, the 48 horse-power Winton Six for 1910 represents the absolute limit of motor car value.



This is the self-cranking, 48 horse-power Winton Six Touring Car—\$3000.

The upper car seats five passengers, and the lower car four passengers. Except in body, they are identical. Six-cylinder, 48 h. p. motor. Cylinders offset. All working parts housed. Oil-bathed multiple-disc clutch. Four-speed, selective transmission clutch and transmission run on ball-bearings. Bosch or Eisemann magneto, and storage battery. The liveliest carburetor we have ever seen. Force-feed lubrication. Frame narrowed in front, to allow short turning radius. 194-inch wheel base. Semi-elliptical springs, with four shock-absorbers and four rubber bumpers. 34-inch wheels. 4-inch tires in front, 4½-inch tires on rear wheels. Low-suspended body. Price, with four or five-passenger touring car body, runabout body, or toy tonneau body, \$3,000. With limousine body, \$4250. With Landaulet body, \$4500. Chassis only, \$2750.



WINTON SIX

The Car that Traveled 184,190 miles on \$142.43 upkeep
—averaging 77 cents per thousand miles.

When Price Does Not Mean Value

Car buyers pay every expense of the car manufacturer. Every expense—legitimate and otherwise.

The car buyer pays the maker's bills for material, pays his payroll, his selling commissions, taxes, insurance, freight, rent, coal bills—everything.

Because every expense of the maker is figured in the price of the car—the price the buyer pays.

The maker who is extravagant, wasteful, a poor business man, is compelled to charge more for his car than is the careful and competent maker.

The maker's extravagance and mismanagement add to the price—but do not help the car's quality.

Remember that.

The extravagant, wasteful maker bluffs his high prices upon buyers who are not careful to ask what they get for their money—

Or who think that high price must mean high quality.

Price and quality are widely different things.

Careful buyers know that already.

Careful buyers get **maximum carmerit** without paying for a maker's racing team, publicity stunts, red-tape and watered stock.

Careful buyers first **analyze cars** and then **compare prices**.

That's the way to get your money's worth.

There is no mystery about motor cars. Any clear-headed man can determine a car's real worth by comparison.

For instance:—

Compare **power**. A 48 horse-power car is worth more than a 30 horse-power car.

Compare **motors**. A six is worth more than a four. A motor with working parts fully housed is worth more than one with working parts exposed.

Compare **clutches**. An oil-bathed multiple-disc clutch is worth more than any other clutch.

(CONTINUED ON PAGE 108)

When writing to advertisers please mention The Irrigation Age.

WINTON SIX

(CONTINUED FROM PAGE 107.)

Compare **transmissions**. The selective type is worth more than the progressive type. Four speeds are worth more than three.

Compare **conveniences**. A self-cranking car is worth more than one that requires cranking.

Compare **operation**. Quietness is worth more than noise. Flexibility is worth more than inflexibility. Hill-climbing capacity is worth so much that you can't afford to lack it. Comfort (always try the rear seats) is priceless; an uncomfortable car is a white elephant on your hands.

Compare **types**. Is it an un-to-date Six or an out-of-date type?

Compare **"previous performances."** Has the car stood up in the past, or is it a new-comer without a pedigree? * * *

Just make these comparisons, and then—compare prices. * * *

Having found that the sweet-running, six-cylinder Winton Six possesses every desirable element a motor car can have, you will note that its price of \$3000 is less than the price of every other quality car on the market.

The Winton Six price is lower because: There is **no water** in Winton stock. (Incidentally, there is no Winton stock for sale.)

There are **no Winton mortgages** or bonds with interest charges to force up the price.

We make the Winton Six in our own plant, eliminating intermediate expense.

The Winton plant is conducted in the most economical manner consistent with high-class results.

There is **no extravagance** in Winton management—no army of time-serving clerks, no load of unproductive labor, nor red tape.

We do **not** give 30 or 40 per cent commission on sales.

Being America's longest-established successful makers, we know how to produce **maximum car-merit**; and knowing that it pays in the long run, we **give our purchasers the benefit** of our economies in production and selling.

That's why the six-cylinder, 48 horsepower Winton Six at \$3000 represents the absolute limit of motor car value.

We want you to **make us prove** this statement.

Because, in proving it, we'll make you as enthusiastic over the Winton Six as we are.

Our catalog is the most complete and thorough ever issued by an automobile manufacturer.

"Light Weight" is a subject we handle without gloves.

"The Difference Between Price and Value" analyzes the worth of cars.

Write us today.

THE WINTON MOTOR CARRIAGE CO.

Member A. L. A. M. Licensed Under Selden Patent.
CLEVELAND, U. S. A.

Winton Branch Houses (owned and operated by the Company) in New York, Boston, Philadelphia, Baltimore, Pittsburgh, Detroit, Chicago, Minneapolis, Seattle and San Francisco.

The 1910 Winton Six Is on Display at These Salesrooms

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has been discovered in southern Nevada, on the main line of the San Pedro, Los Angeles & Salt Lake R. R., only a few hours' ride from Los Angeles, California.

On October 10th a well was brought in, flowing 120 miner's inches at a depth of only 325 feet.

The soil is the very richest, producing pears, apples, figs, alfalfa (alfalfa returns over \$100 per acre) and all kinds of vegetables. One man received over \$1,000 from one acre of vegetables!

There are 15 flowing wells; over 7,000 acres of land have been taken up since the first of October. A syndicate of wealthy mining men from Tonopah have taken up 3,000 acres and are preparing to irrigate it and sell it to settlers. All this land is within eight miles of Las Vegas, the coming town of Nevada. Five years ago Las Vegas existed only on the map, and what is now a thriving town was only sagebrush. Today, there is a population of 1,800, macadamized streets, electric lights, telephone, a fine hotel, The Nevada, equipped with all modern improvements; the railroad is expending one million dollars in machine shops; the Pacific Fruit Express Co. have built a new Ice Plant costing \$250,000; 125 cottage houses are being built for the skilled laborers who will come to work in the railroad shops. Las Vegas is the supply point for the great mining sections of Tonopah and Goldfield.

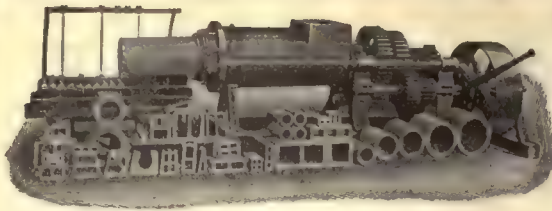
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We are the Largest Dealers in Land in Southern Nevada

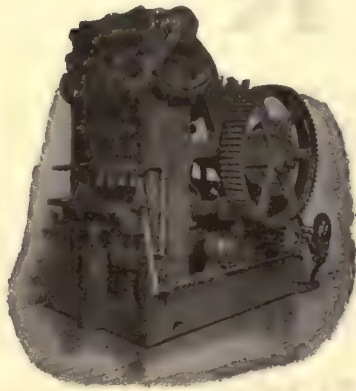
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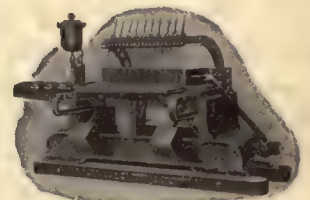
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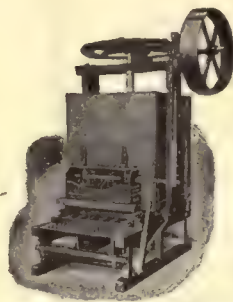
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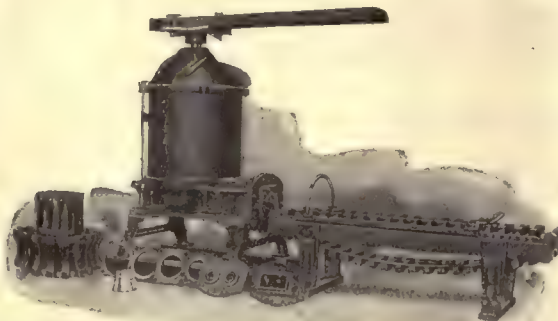
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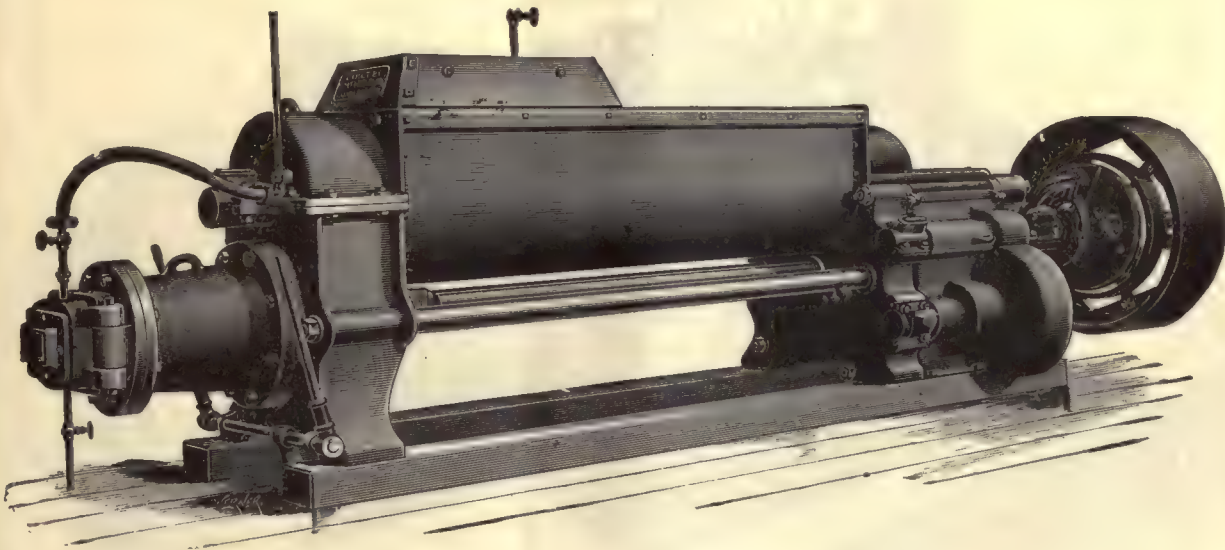


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Products of our Auger Machines

UNION MACHINES WITH PUG MILLS COMBINED



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Outfits for Drain Tile, Hollow Ware, Building
and Paving Brick and other Clay Products

If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

AMES DOUBLE ACTING CONTINUOUS FLOW PUMPS

In practice, with ordinary types of double-acting pumps, the piston speed must be slow enough to allow the water column to start gradually. Water is non-elastic and incompressible as iron. A water column hundreds of feet long must be started its whole length at once. A large part of the useful power applied is wasted in starting the water column from rest at every stroke. With such cylinders a foot valve is required, and there is generally some loss caused by slippage here. The efficiency of such cylinders and power heads is usually figured at 40 per cent to 50 per cent.

Small capacity, due to low piston speed, a large loss of useful power, and short life due to the shocks on the moving parts, are the objections to the use of the ordinary types of double-acting pumps.

The **Ames Double-Acting Continuous-Flow Pumps** overcome all the foregoing objections by keeping the water column in constant motion upwards, without stopping at each stroke. This permits high piston speed and great capacity; saves power lost in starting the water column from rest, and there are no shocks on the moving parts. This action is produced by the patent eccentric gearing shown in the cut.



There are two sets of this gearing in each power head. Each bucket is connected to the crankpin of a gear. Each gear is on a separate shaft, independent of the other, and driven by a double eccentric pinion. Both pinions are keyed fast on the same pinion shaft. Uniform revolution of the pinion shaft produces uniform upward motion of the buckets and water, but the down stroke is made in less time than the up stroke.

As the upper bucket carries the load up, the lower bucket, with clapper wide open, travels down at a higher speed, passes the lower dead center, and travels part of its up stroke before the upper bucket has passed the upper dead center. As the lower bucket rises, it reaches a point where its speed is exactly equal to the speed of the upper bucket, when the lower clapper closes, and the lower bucket takes the load. As the lower bucket is then traveling at exactly the same speed as the upper bucket, and consequently at the same speed as the water column, it follows that it takes the load without shock, no matter what the piston speed may be. It is like giving a push to a moving body instead of starting the same body from rest.

This action of the valves, termed lap, takes place with each bucket alternately, or twice in each revolution of the power head, and this combination of a spur gear with a crankpin is the simplest and most efficient known way of producing such action. There are no cams, levers, or exposed sliding surfaces as in all other devices, and in combination with the other mechanical features of our pumps is the best and most economical way of pumping water.

The power head is placed on the surface of the ground, and may be driven by steam or gas engine or electric motor. The driving pulley is furnished to suit the type and speed of the motive power, using a friction clutch pulley when driven by engine or jack shaft, or a plain pulley when driven by electric motor.

The cylinder is placed at a point in the well where it is always submerged, and requires no priming. The discharge may be at the surface or against high heads through long pipe lines above the surface.

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OREGON is famous for its prunes, peaches, apples, pears and cherries. Rev. F. N. George, of Salem, Ore., writes: "My cherries yielded at rate of \$640.00 per acre." L. T. Reynolds, Route 9, Salem, Ore., says: "Harvested 3,300 boxes apples in 1907, from eight acres.

WASHINGTON produces wonderful crops of grain and fruit, and in this state the prices of good land range from \$10 to \$50 per acre. The report of the First National Bank of Dayton, Wash., shows lowest deposit for any one month in 1908 to be \$200,000, and the highest for any one month was \$543,000.

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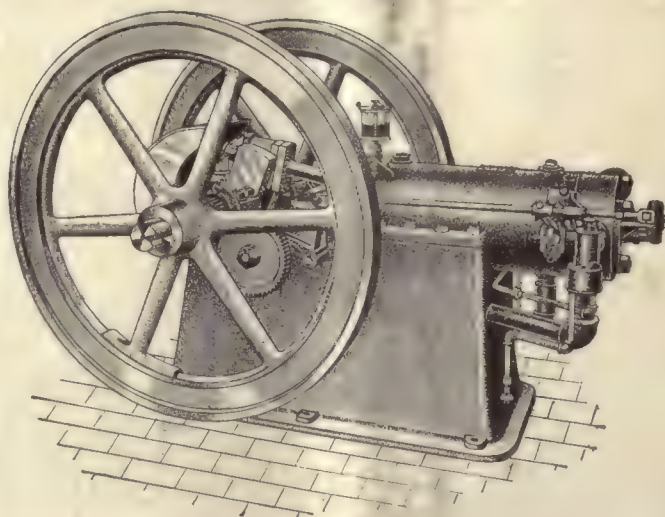
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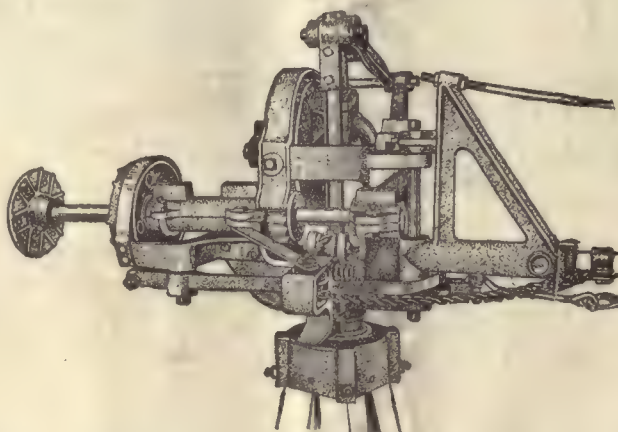
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Carefully
at the Best

**Windmill
Head**

Ever Made



See that
**Extra
Bearing**

on the
Wheel Shaft
and the

**Center Lift
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THE IRRIGATION AGE

VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO. 3

CHICAGO, JANUARY, 1910

ONE OF THE COMMANDMENTS IS



We sell outright or lease.

N. B. Agents wanted in unoccupied territory.

OUR FULL LINE COMPRISES:

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The Austin Levee Builder
The Austin Drag Line Excavator

The Austin Side Hill Ditcher
The Austin Highway Ditcher
The Austin Orange Peel Ditcher

The Austin Rolling Platform Traction
The Austin Stump Puller and Grubber

Send for Catalogue "S"

F. C. AUSTIN DRAINAGE EXCAVATOR CO.,

Railway Exchange
Chicago, Ill.

The sides of the ditch shall be true and smooth and shall slope back from the bottom of the ditch at an angle flat enough to prevent the earth from falling, caving or slipping.

Except solid rock no material stands upright when cut with vertical sides. All other materials wash and slide until they come to a certain slope, when they will remain stationary. This is called by engineers the natural slope. Now, if in the beginning a ditch is excavated with its sides inclined to the natural slope of the materials through which the channel runs, it is certain that the sides being in equilibrium will not need to adjust themselves by caving and sliding. This natural slope of sides must be obtained in one way and no other—by cutting down the earth exactly to slope plane and not an inch farther. If the sides are gouged out haphazard beyond the slope plane the ditch can be made true to slope only by trimming and filling, and as this must be done with loose earth it cannot be by any ordinary amount of labor be made as firm and as solid as the original soil.

The Austin Drainage Excavator is a machine for excavating ditches with sloping sides in one operation.

Morris Machine Works Baldwinsville, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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CHICAGO, ILLINOIS



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is the new name of
The Overland Limited
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—EVERY DAY—
VIA
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Electric Block Signals All the Way
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Dustless, Perfect Track

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E. L. LOMAX, G. P. A.,
Omaha, Neb.



The Temple Irrigation Equipments the most Economical and Certain Means of Lifting Water

55 YEARS' EXPERIENCE

Write us for Information and Prices—State Requirements



CENTRIFUGAL PUMP AND GASOLINE ENGINE IRRIGATION OUTFIT.

The Temple Water Elevators -- The Temple Centrifugal Pumps

Manufacturers of all kinds of Hand and Windmill Pumps

Also Manufacturers Single Cylinder, Double Cylinder and Four Cylinder Gasoline or Kerosene Engines

Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

THE TEMPLE PUMP CO.

Factory, 15th St. and 15th Place, near Canal St.
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He Says He's "Green"

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Questions Answered Free

DON'T be backward about coming forward with your questions. This page is devoted to a full explanation of the newest methods in irrigation—

**DITCHING
LAND LEVELING
BRUSH GRUBBING
LATERAL MAKING
BORDER THROWING
SHALLOW DRAINAGE
LATERAL CLEANING
ROAD BUILDING**

No. 14—Settler is "Green."

Question—"I'm green about this irrigation business, especially about the flow of water and how to get it to the seeds I plant. What implement would I need?"

Answer—Most settlers in Idaho and vicinity find their land covered with sage brush. Land will be level in some places, "humpy" in others with low spots. (Look out for the low spots. If they get wet and soggy that part of your land will be a dead loss to you.)

If the growth of sage brush is abundant, be assured that your land is valuable and fertile.

Grubbing Sage Brush.—You'll be in a big rush this spring to clear your land. The implement to use is the remarkably successful machine, the 20th Century—a brush grubber—land sloper and leveler—lateral cutter—drain maker—border maker—road builder—border thrower—all combined in one easy-to-buy implement.

Grub Brush \$1.50 to \$1.75 per acre.—You'll "thank your stars" if you invest in a 20th Century. You will have your sage brush cut and burned while your neighbor will be rushing around for some contractor or will use a bent rail at twice the cost compared with your way. With our attachment fastened to the pole you can clear 4 acres a day for \$1.50 to \$1.75 per acre. Remember this is but one of many uses to which you can put the machine.

No Plowing Needed.—After our grubber has cleared your land, you'll find that alfalfa or cereals can be drilled in at once, without further preparation of the soil. This means a tremendous saving in time in early spring.

Water.—Your water supply will come from your main canal. Your land must slope gently from this canal so that water, when turned into small ditches and laterals, will flow with sufficient velocity to the rows where seeds, trees or bushes are planted. These laterals should be "V" shaped.

Sloping Land.—Here's where so many irrigation farmers "fall down." They are in such a "sweat" to get some crop in so as to see some profits that they fail to properly slope and level their land. Don't you make this mistake. Get onto your land early and take sufficient time. If you go on your claim without providing yourself beforehand with easy-to-handle, quick-to-use implements you'll likely lose the whole summer's profit.

Don't depend on homemade affairs, for raw supplies will be high priced and not always easy to get.

Provide yourself with the Many Purpose 20th Century Grader. Then you'll be fully equipped.

Making Laterals.—Don't use round bottom laterals. The 20th Century cuts a sharp pointed "V-shaped" lateral that conveys water rapidly with minimum waste. The cost of cutting small laterals, say 15 to 18 inches deep, will be from \$1.25 to \$1.50 per mile.

A Good Letter.—This letter from a well-known man in Jerome, Idaho, clinches our ditch argument: "I received your letter of November 10th, in which you ask me to buy one of your 20th Century Graders. I already have one. One of the machines sent to the Jerome Mercantile Company was for me. Have used the machine for 2,000 feet of ditch and found it more than satisfactory. It will be a labor saver and a great help on my 320 acre ranch. What terms are you offering for agency? I might push it myself, demonstrating it on the ranch." G. I. Towle, Manager Towle Land Company.

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This has a stiff, steel cutting edge sharpened and pointed to rip open the brush. At each side are two strong, keen knives that cut a swath 30 inches wide. Is attached to 20th Century tongue.



No. 1—20th CENTURY CUTTING "V" SHAPED LATERAL

The loose dirt on the sides can be cut off, moved over, and leveled with the same machine. Thus no ground need be wasted.

20th Century Grader



No. 3—MACHINE SET FOR LEVELING.

For cutting down "bumps" and hummocks, the blade is set at right angles, then lowered by main lever and a moderate slice cut off. The dirt is then spread and "spilled" as desired.

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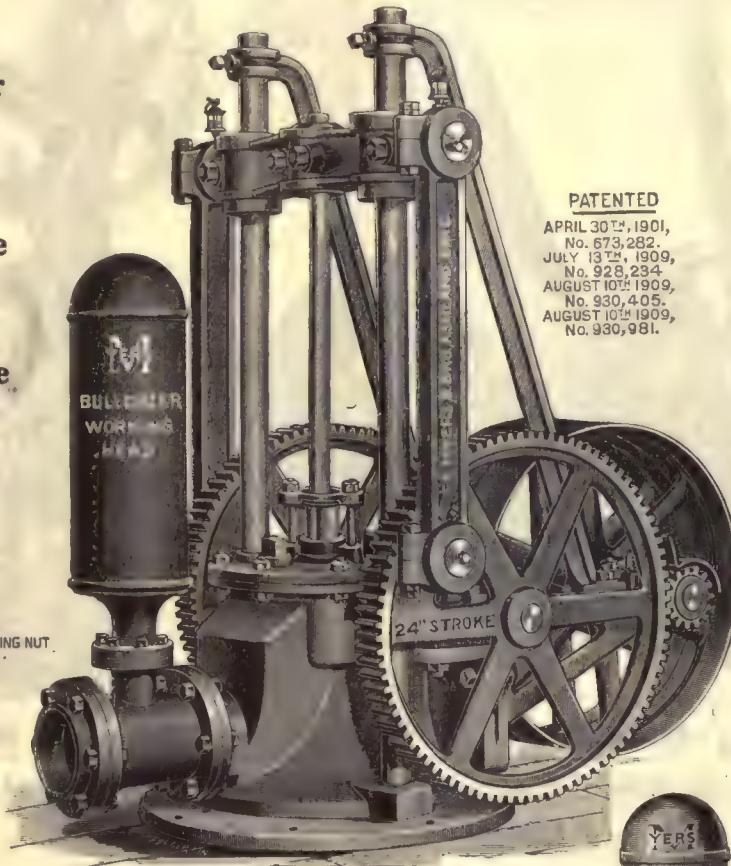
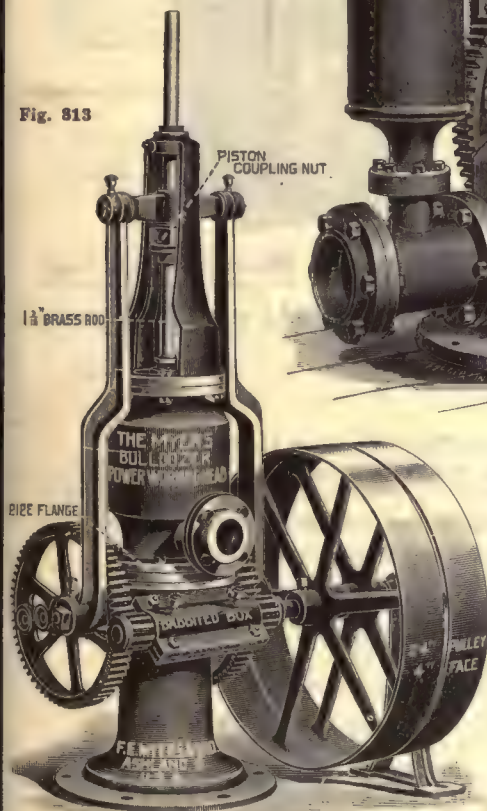
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5 to 24 inches

Size of Discharge
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Fig. 813



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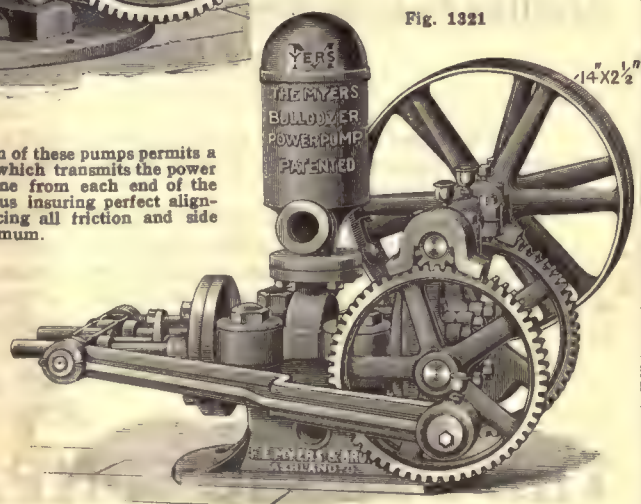
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Stroke
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Cylinders
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Size of
Discharge
Up to 4 inches

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per Hour

Fig. 1321



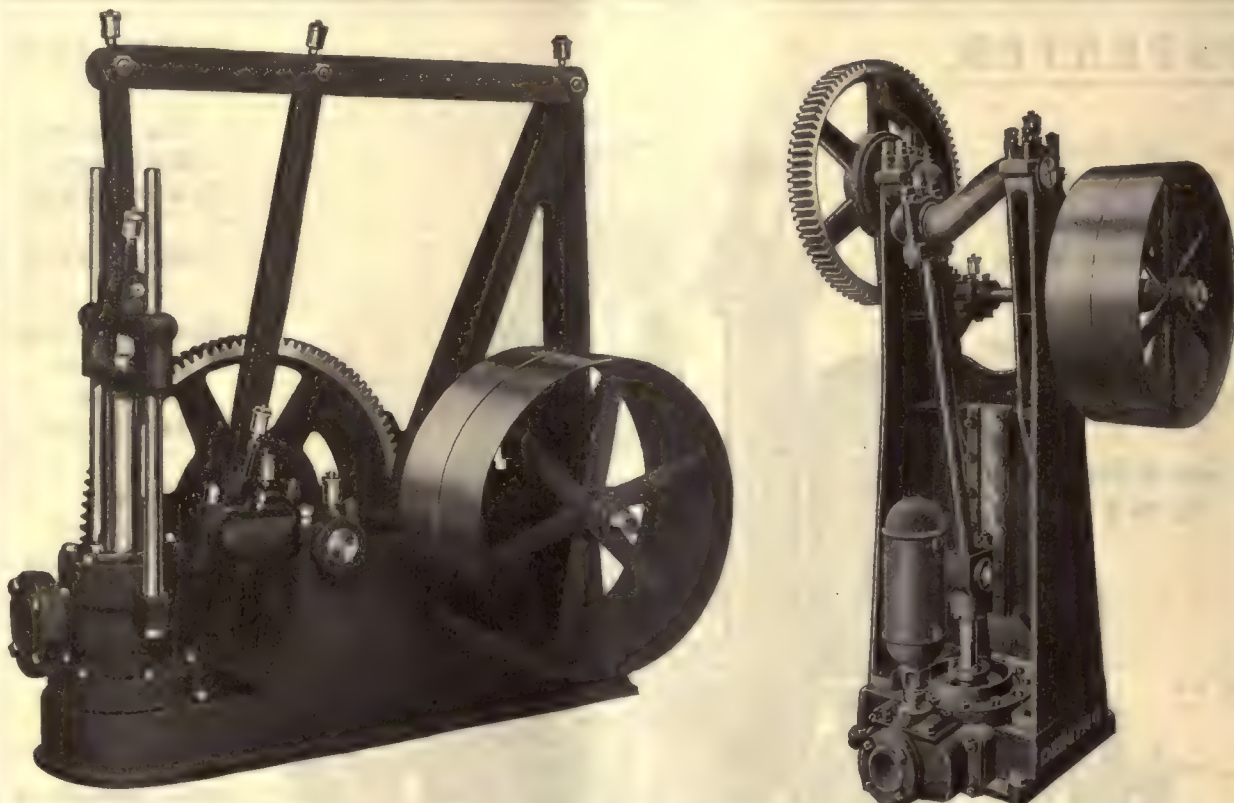
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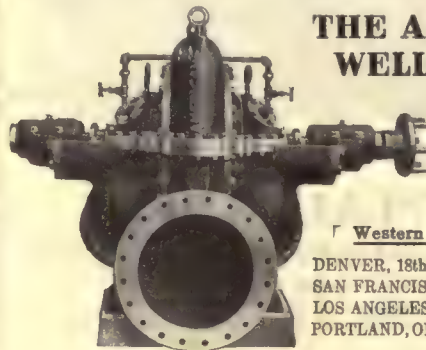
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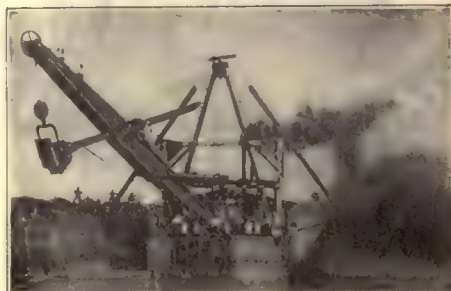
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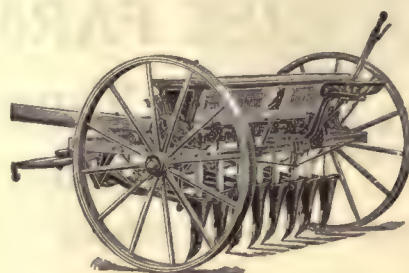
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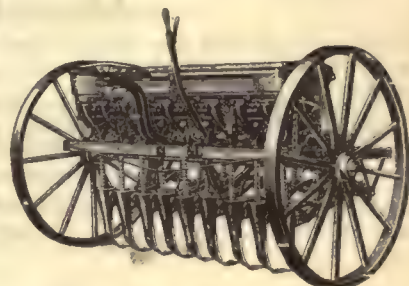
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THE IRRIGATION AGE

VOL. XXV

CHICAGO, JANUARY, 1910.

No. 3

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
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THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, - - CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

SUBSCRIPTION PRICE.

To United States Subscribers, Postage Paid, . . . \$1.00
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Official organ Federation of Tree Growing Clubs of America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 25 years old and is the pioneer publication of its class in the world.

Forestry Chief Is Official Outcast.

Pinchot is undone. Trapped in his own intrigues, his motives fully revealed, he is shorn of the authority and deprived of the high office of Forester of the United States. The action of President Taft in thus forcing from the government payrolls a man who lost no opportunity to embarrass the administration, and, by his pernicious activities in the field of petty politics, has been a menace to good government, excites only commendation and respect.

For months Forester Pinchot has been anxiously waiting for the president to force him from office. He was ambitious to pose as a martyr for conservation policies. He had hoped that his discharge might appear to the public as a crown of thorns. In vivid imagination he painted a picture of the crucifixion with himself lying upon the cross.

Yet how signally he failed to deceive the people. A patient administration watched his fanciful efforts in the play of politics and boded its time. As the Forester became more furious at the delay in his discharge, and his inability to don the waiting crown of thorns, the president and his cabinet noted his operations, but withheld the mark of open censure.

Not until Gifford Pinchot became so deeply mired in his schemes that a candid public might readily discover the motive, did the official axe descend. At the hour when he dreamed of transfiguration, Pinchot is

convicted of insubordination, is accused of dishonesty of motive, and is discredited in integrity. And his own acts supply the testimony.

Nor can this outcast from official life lay claim upon the companionship of those sturdy congressmen and senators who are banded together as insurgents to fight for a cause they believe to be just. His only object was self aggrandizement. His motive was solely the embarrassment of the existing administration that the Third Term idea might be promoted. He was merely a player at the game of politics.

In the charges as presented by Glavis against the policy of Secretary Ballinger, there were frequent references to Attorney General Wickersham, and it is perhaps to this reference that the attack provoked unusual discussion and interest. Since the recent declaration of the Attorney General that Glavis withheld or failed to mention important records and matters pertaining to his charges, and that these omissions must throw a new light upon Secretary Ballinger's policies in regard to coal land entries, it must be conceded that the importance of these charges is waning. Recent action by the house at Washington is sufficient proof that the forthcoming investigation of the department of the interior shall be sufficiently critical to give full information to the public.

But the real field for rejoicing at the overthrow of the Pinchotian policies is to be found in those western

states where are the great tracts of land, withdrawn from settlement for no other reason than to satisfy the theoretical conservation of forests. No more will the arrogance and arbitrary rulings of the forestry bureau prove an impediment to the development of agriculture. Under the direction of a competent Chief of Forestry it may be anticipated that proper surveys will be made and those tracts that are today available for farming purposes, and are not valuable as timber reserves, will be released from Government control and will help to provide happy homes for a growing population.

**Divide
Over
Bond
Issue.**

Grinding of the legislative mill at Washington seems to bring forth no food for the gratification of the settlers on governmental irrigation projects. The \$10,000,000 bond issue through which they hoped for respite from their long years of yearning for water, seems no nearer than the day when President Taft presented his views of the situation and the necessity for action by congress.

Western senators and congressmen seem somewhat divided in opinion as to the proper method by which to afford this financial relief. Some are unequivocally in favor of the national bond issue. Others believe that funds might be advanced through a different class of security. It is generally supposed that the problem is being discussed outside the legislative halls in an effort to reach a conclusion satisfactory to all.

With a divided west, part of which is fighting his administration by supporting Forester Pinchot, and a part of which is praying for his influence in assisting the bond issue, it is not to be wondered that President Taft is giving first attention to the proper vindication of his policies.

As indicated in the IRRIGATION AGE two months ago, there is decided sentiment among eastern congressmen that the issuance of securities for completion of irrigation projects establishes a dangerous precedent and is therefore inadvisable.

**Eastern
Readers
Seeking
Information.**

There is no more trusty criterion of the growing interest in the reclamation of desert lands and the building of homes in the western irrigated districts, than can be found in the increasing demand for the IRRIGATION AGE, the journal that for twenty-five years has sung the praises of the west and pictured the valley and the plain where man and his method has changed the face of nature from a frown to a smile.

Let facts proclaim the story—a total of 113 new subscribers to the AGE were added in one day last month. Of this total, 105 were received by mail and 87 writers accompanied the order with check or money order. Within a period of forty-five days nearly 3,000 names have been added to our mailing list.

These facts are not submitted for the purpose of enlarging advertising patronage, but are intended merely to cheer the hearts of those irrigation promoters who are today engaged in a struggle against nature in an effort to win success, and incidentally to provide peaceful homes for the eastern overflow.

Nor does the publisher take unto himself the credit or glory for achievement when the subscription list goes bounding upward. It is the virtue of the field in which his publication has worked. The public is awakened to the fact that there is a great and glorious west where nature has combined in earth her dearest treasures. What matters it if a designing Providence has withheld the rains, but, by providing natural reservoirs and rushing streams, has set for humans the task of surmounting obstacle to reach success.

Come thou skeptic who hath opened but one eye since the lion hunter left the American shores. Open both eyes and view the future in the light of the present. If 1910 does not mark an epoch in the irrigation age then the IRRIGATION AGE cannot judge by appearance or forecast events by the indications that grow daily and lead always to the same conclusion.

**Rumors of
Senate
Committee
Report.**

Pending the receipt and publication of the report of the senate committee on Irrigation and Reclamation of Arid Lands, there continue to arise vague but persistent rumors that its members, while not united upon specific recommendations, will intimate that the government should take steps to confine its operations to those irrigation projects for which funds are available for prompt completion.

Should this report contain specific recommendations to this effect, or should its intimations in this respect be reasonably plain, it cannot be regarded as other than a direct slap at the past administration wherein young and inexperienced engineers were allowed full power to outline and commence operations on irrigation projects for which there were inadequate funds.

Readers of this journal as well as the thousands of settlers under government projects are already familiar with the results. Long delays, carrying gradually increased charges for water rights, have succeeded in discouraging many settlers and forcing them to leave before the arrival of the government water, even though they had invested their all in improvements. Ill success in colonizing the government irrigation tracts have so depleted the available funds that there is prospect of slow returns of the money invested. Unless conditions change the much heralded "revolving" fund will fail to revolve.

Probably no man appreciates the necessity for conservative policy in government work better than Secretary Ballinger. It can be predicted that under his direction a more business like management will be pur-

sued and that the government will not be plunged into operations which must be slowed to a snail's pace for lack of finances. Had this policy been adhered to under the former administration there would now be no demand for a national bond issue for completion of the lagging government irrigation projects.

Attention of readers is respectfully but urgently directed to the series of articles now appearing in the AGE and relating to the Carey Act, the law that has resulted in more good to the irrigable sections of the west than any other state or national enactment. The writer, Mr. E. F. Bohm, of Cleveland and Chicago, is a deep student of irrigation affairs and his utterances upon the subject of the Carey Act are well worth the attention of all readers of this journal.

Although not actively engaged in irrigation work at the present time, Mr. Bohm is enabled to the better discuss this subject in a broad and comprehensive manner. It is the opinion of the editor that this series of articles will constitute the most complete and valuable treatise ever presented to its readers or to the public. To accommodate those who have already become interested in Mr. Bohm's work and are demanding the entire series in handy form for future reference the IRRIGATION AGE has arranged to print the matter complete in pamphlet and when ready for distribution further announcement will be made in these columns.

President Taft is at bay. Urged on by repeated attacks of the third term boomers, directed first against his policies and next against his personal and official integrity, the president has turned upon his foes and will allow the search light to play upon all correspondence and matters pertaining to his cabinet office occupied by Mr. Ballinger.

What effects may come from this investigation cannot be predicted. Since Glavis made his charges and they were greedily embraced by every enemy of the administration and every agitator in the band of Third Termers it is conceded that the inquiry will allow wide scope. The action of the president in requesting the search for evil doings in his department of the interior, must be viewed as a preliminary indication that the seekers after campaign material will be sorely disappointed. The president is to be commended for his firm and honest reply to his critics in asking an investigation.

Upon the result of this inquiry Forester Pinchot must stand in the limelight either as a champion of the public welfare, or a base fabricator conniving with politicians to discredit an administration by foul and infamous means. Since the chief forester floated his famous "water power trust" story at the irrigation congress in

Spokane it is known that he has cherished a positive and open enmity toward Secretary Ballinger and the administration that aided in puncturing his cleverly contrived romance of the Montana "water power grab."

Believing that Secretary Ballinger would demonstrate his capability for the duties of the office he has assumed, and that only motives of honesty can be attributed to him in his official as well as his private life, the IRRIGATION AGE has supported his attitude in many matters. But from the secretary of the interior this journal has no favors to ask and while it rests firm in the belief that the inquiry will result in complete vindication of his policies, an adverse finding by the inquisitors will bring no effort on the part of this paper to meliorate or condone the offense.

Investigate Wild-Cat Irrigation Securities.

Following in the wake of the hundreds of legitimate irrigation enterprises in which capital has been invested by the purchase of bonds and from which promoters and bond holders have realized profit without unusual hazard, there may be expected a swarm of wild-cat projects in which an innocent public will be urged to invest its savings upon promise of large interest and absolute safety of principal. Already this school of sharks has appeared upon the horizon with well organized plans for the capture of the unwary bank account.

No more is it the duty of a reputable class journal to promote and augment the interest of the public in its chosen field, than is it an obligation to protect its readers against such forms of deceit and misrepresentation as may come to its notice or be unearthed by investigation of existing conditions.

To the publisher of the IRRIGATION AGE the clink of gold is not unwelcome. But were that gold to be purchased by prostitution of his editorial columns to nefarious schemes for exacting monies from the pockets of the people, the cost overweighs the price and there can be no bargain.

Qualified representatives of this paper are now at work, studying the financial horizon, ready to throw the search-light of truth upon any stock-jobbing and bond-juggling concern that may appear in the irrigation field. Law suits must be avoided and the editorial pen must be smoothed at times, to mere intimation without deductions from fact. Yet so far as it is possible for this journal to use its editorial and news columns in reasonable opposition, the illegitimate in irrigation bond schemes shall not flourish.

As a foreword to the thousands of new readers who have been placed on our mailing list, it may be stated that the editor will be pleased to give any information relating to, or advise any investors in regard to the basic values of bonds. Since a reputable bond house, however, has greater facilities for investigation than this

journal, investors are urged to appeal to these institutions first, and only upon failure to secure satisfaction to address the AGE. Should our special agents be able to reach conclusions within the next thirty days, matter calculated to interest and instruct readers will probably appear in the February issue.

While the field of investment in irrigation bonds is so wide, and while there are so many reputable concerns offering these securities at reasonable rates of interest, it is to be deplored that rascals may not be barred. All reliable bond houses may not be represented in the advertising pages of the IRRIGATION AGE but readers may place confidence in those whose advertisements appear in this or any other issue.

Westerner's Opinion of Pinchot.

In direct line with the Ballinger-Pinchot controversy is an interview with Mr. C. F. Robertson, mayor of Worland, Wyo., in the heart of the Big Horn basin, given in the office of this journal on the sixth day of January, 1910. Mr. Robertson is a pioneer in the Big Horn basin and knows whereof he speaks. He has the following to say:

To those of us who live in the inter-mountain west and face the actual conditions affected by the public land and forest reserve policies, the attitude of Gifford Pinchot is so ridiculous that one wonders at the credulity of the unsuspecting public in "swallowing his bait." His whole theory of conservation of the forests is founded upon false assumptions; for instance, he would make the people believe that the forests upon the mountain sides hold back the snow and conserve that moisture, when in fact, one who has been in the high mountains in summer knows that the only moisture conserved is in the glaciers, high above the timber line. While I do not believe in willful waste of any natural resource, why keep the timber for future generations that will be using concrete and steel and have comparatively small use for lumber?

If Gifford Pinchot had held himself closely to the line in performance of his duties, instead of "gallivanting" over the country, parading himself before the public, he could have saved millions of feet of lumber destroyed by forest fires last year, and the same during all past years of office.

It is strange that charges have not been filed against him for failure to perform his sworn duty in protecting the forests from fires. The fact is that at the very time Pinchot was at the Irrigation Congress in Spokane giving his time to conducting a political fight against Ballinger, I looked out and saw in three different directions dense smoke in the mountains from forest fires that raged for days. The thought came to me at that time, how utterly useless the forestry division was and how far it came from fulfilling its purpose.

Exit Pinchot, and give the country a man of affairs as chief forester who will conduct the office along practical lines in the interest of the whole people.

Mr. Robertson is one of many westerners who have made statements of this character, and it can be safely said to reflect the general sentiment of those who are faced with this overshadowing question.

**Send \$2.50 for The Irrigation
Age one year and
The Primer of Irrigation**

SOUTHERN IDAHO COMMERCIAL CLUBS.

Central League Formed for Exploitation of Lands and Resources of Twenty-three Cities.

Called into being four years ago as a result of the conviction upon the part of many of the aggressive young business men of southern Idaho, that the interests of the State could be immeasurably advanced through co-operation of effort, the League of Southern Idaho Commercial Clubs has since then amply justified its existence, and its methods may well serve as models for other organizations, pursuing campaigns of publicity.

The activities of the League are focused almost entirely in the direction of laying before the public authentic information regarding the resources of southern Idaho. Where formerly the commercial bodies of the various cities (twenty-two cities are identified with the League at present) struggled with the problems of publicity—often with inadequate resources—they are now enabled to maintain a Central Bureau at Boise, with a permanent Secretary, devoted to their interests. It is apparent that the merits of each individual section are heralded without bias, and with strict regard to facts.

The League has been convened, as a body, once each year at one or the other of the cities embraced by it, the first meeting having been held at Weiser, the last one at Pocatello, during the month of October, 1909. An Executive Board of seven members meets at Boise for conference every sixty days.

Charles M. Hill, the President of the League, is one of the young men of force and character who has "made good" in Idaho. He is a native of Minnesota and removed to the city of Twin Falls, Idaho, five years ago. He is a member of the firm of Hill & Taylor, Real Estate and Insurance Brokers.

Mr. Riley Atkinson, Secretary of the League, is another man of the same stamp. Although, like Mr. Hill, still very youthful, his character and his success in achieving the incumbency of such an important office, are evidences of what may be accomplished in Idaho.

CANDIDATE FOR CONGRESS.

Mr. G. L. Shumway, who for several years acted as assistant in editorial work on The Irrigation Age, is now a candidate for Congress in the Sixth District of Nebraska. Mr. Shumway is well known throughout the entire country among irrigationists and conservationists as a man with steadfast purposes not easily carried away by passing fads and fancies, so common with politicians. The editor of this journal is not acquainted with the other candidates, but he does know that regardless of politics, Mr. Shumway has as much, or more, influence in and out of politics as any man in Nebraska, with the exception possibly of Mr. W. J. Bryan, Victor Rosewater and one or two others, and we make no exceptions when it comes to the question of the public domain. Should he be elected, it can be predicted that his work will not be confined to members of his own party, for Republicans and Democrats alike recognize in him a character which rises above partisanship. The state of Nebraska will gain distinction by sending Mr. Shumway to Congress.

GROW SEEDS ON IRRIGATED LAND.

The opening up of the lands embraced in the reclamation projects of the Government is attracting the attention of the wholesale seed houses.

The new lands which are entirely free from weeds and other injurious forms of plant growth, are regarded by the seed men as ideal for the raising of certain kinds of plants for seeds.

On the Huntley project, in Montana, the Northrup-King Seed Company of Minneapolis are planning to experiment in the growing of seed peas during the crop year of 1910. This company expects to plant about 1,500 pounds, and if successful other legumes will be grown for seed. Contracts are now being made with the farmers at the price of 2 cents per pound for all seed peas grown.

Notes on Practical Irrigation

D. H. Anderson

SOIL IN GENERAL.

Foundation of Plant Life—Power to Absorb Moisture.

The reader has already discovered that the inorganic elements consist of decomposed rocks and minerals, which have assumed a variety of forms by combining with one another, and now he has reached a point which is the foundation of plant life, being that other essential in all soils, the organic elements, which must exist in a greater or less proportion. This organic matter consists of decayed animal and vegetable substances, sometimes in brown or black fibrous particles, many of which, on close examination, show something of the original structure of the objects from which they have been derived; sometimes forming only a brown powder intermixed with the mineral matters of the soil, sometimes entirely void of color and soluble in water. In soils which appear to consist of pure sand, clay, or chalk, organic matter in this latter form may often be detected in considerable quantities.

In the table already given, the percentage of humic acid, insoluble humus, and organic substances containing nitrogen, is given as 3.387 per centum, a very small quantity apparently, but really amounting to 124,521 pounds or 62¼ tons, in a top layer of soil eight inches deep, covering one acre of land; a quantity sufficient to supply crops with essential matter for plant food during many years without manuring.

This vegetable matter is the result of vegetable decomposition, a decay which means fermentation ending in putrefaction, a purely chemical process. Whence it is said: Growth is a living process; death, or decay, a chemical process. Putrefaction is the silent and inward march of decay, its goal being humic acid, which in its turn produces life. The saying of that great physician of the past centuries, Paracelsus, may be aptly quoted here: "Putrefaction is the first step to life." Everything travels in a circle in the vegetable as well as in the animal kingdom: The egg, or germ must first putrefy to produce an animal, and the seed, or plant germ, must first putrefy before there can be any living plant.

Three Classes of Soil.

It has been said that various names have been given soils, according to the predominating mineral of which they are composed, but in reality, there are only three great varieties of soil; sand, clay and loam, the latter being a mixture of granite sand and clay. The great distinctions in the scale of soils, may be said to be sand and clay, all other varieties proceeding from mixtures of these with each other. Now, the sand may be siliceous, or calcareous, that is, composed of silicates or lime. By clay is meant the common clay abounding everywhere, and composed of about thirty-six parts of alumina, sixty-eight parts of silica, oxide of iron, and salts of lime, and alkalies, 6 parts. A sandy clay soil is clay and sand, equal parts; clay loam is three-fourths clay and one-fourth sand; peat soil is nearly all humus, which we have seen

is vegetable matter decomposed, decayed or putrefied; garden, or vegetable mold is eight per cent humus, the rest being silica, and the other mineral substances; arable land is three per cent humus. There are, in addition to these varieties of soil, several special varieties which are fortunately not general, and therefore, need not be more than referred to. They are those peculiar conditions found in the "black waxy," "bad lands," "hard pan," upon which nothing short of dynamite will make any impression so far as discovered, and the "tules," which are common to California, but are extraordinarily fertile when reclaimed, being similar to peat bogs without the disadvantages of the latter, and that are known as "swamp" or "marsh lands." When it comes to "desert lands" in the sense of the Acts of Congress, they lack only water to make them as fertile as any lands in the world. They will be treated in the chapter on Arid and Semi-Arid Lands.

Aside from the chemical composition of soils, what equally concerns the farmer is their physical characteristics. These may be enumerated under the terms cold, hot, wet, and dry land. And these are dependent upon weight, color, consistency, and power to retain water. The relation of the soil to consistency makes it light or heavy; its relation to heat and moisture makes it hot or cold, dry or wet.

Taking the varieties already specified, sand is always the heaviest part of soil, whether dry or wet; clay is among the lightest parts, though humus has the least absolute weight. To calculate more closely: a cubic foot of sand weighs, in a common damp state, 141 pounds; clay weighs 115 pounds, and humus, 81 pounds, and garden or vegetable mould and arable soil weigh from 102 to 119 pounds. The more humus compound soil contains, the lighter it is.

Why Sand Plains Are Hot.

The power of a soil to retain heat is nearly in proportion to the absolute weight. The greater the mass in a given bulk, the greater is this power. Hence, sand retains heat longest, three times longer than humus, and half as long again as clay. This is the reason for the dryness and heat of sandy plains. Sand, clay and peat are to each other as 1, 2, 3 in their power of retaining heat.

But while the capacity of soil to retain heat depends on the absolute weight, the power to be warmed, which is a very important physical characteristic, depends upon four circumstances: color, dampness, materials, and fourth the angle at which the sun's rays fall upon it.

The blacker the color, the easier warmed. In this respect, white sand and gray differ almost fifty per cent in the degree of heat acquired in a given time. As peat and humus are of a black, or dark brown color, they easily become warm soils when dry, or secondly, dampness modifies the influence of color, so that a dry, light-colored soil will become hotter sooner than a dark wet one. As long as evaporation goes on, a difference of ten or twelve degrees will be found between a dry and a wet soil of the same color. Thirdly, the different materials of which soils are composed exert but very little influence on their power of being heated by the sun's rays. Indeed, if sand, clay, peat, garden mould, all equally dry, are sprinkled with chalk, making their surfaces all of a color, and then exposed to the sun's rays, the difference in their temperature will be found to be inconsiderable.

Fourthly, the angle at which the sun's rays fall on the

land, has much to do with its heat. The more perpendicular the rays, the greater the heat. The effect is less in proportion as these rays, by falling more slanting, spread their light out over a greater surface. This point is so well understood that it is not necessary to dwell any longer upon it, further than to add, that there are localities where every degree of heat diminishes the prospect of a good crop, particularly in hot regions, and the circumstances should be taken advantage of to obviate the danger of loss. A northern exposure or an eastern exposure, or a crop on a slope may sometimes realize more benefit than if this knowledge were disregarded.

Humus Absorbs Moisture.

The relation of soil to moisture and gas, particularly moisture, is of great importance in the case of irrigation. All soil, except pure siliceous sand, absorbs moisture, but in different degrees. Humus possesses the greatest powers of absorption, and no variety of humus equals in its absorptive power, that from animal manure, except those heavily charged arid and semi-arid lands, in which fibrous roots and vegetable matter form a large part of the elements they contain. The others rank in the following order: Garden mould, clay, loam, sandy clay, arable soil. They all become saturated with moisture by a few days' exposure.

It is a very interesting question. Does soil give up this absorbed water speedily and equally? Is its power of retaining water equal? There is no more important question to the irrigator. As a general fact, it may be stated, that the soil which absorbs fastest and most, evaporates slowest and least. Humus evaporates least in a given time. The power of evaporation is modified by the consistency of the soil; by a different degree of looseness and compactness of soil. Garden mould, for instance, dries faster than clay. As it has already been shown, that the power of being warmed is much modified by moisture, so the power of a soil to retain water makes the distinction of a hot or cold, wet or dry soil.

Connected with this power of absorbing moisture, is the very important relation of soil to gas. All soils absorb oxygen gas when damp, never when dry. Humus has this power in the highest degree, however, whether it be wet or dry. Clay comes next, frozen earths not at all. A moderate temperature increases the absorption. Here are the consequences of this absorptive power.

When earths absorb oxygen, they give it up unchanged. But when humus absorbs oxygen, one portion of that combines with its carbon, producing carbonic acid, which decomposes silicates, and a second portion of the oxygen combines with the hydrogen of the humus and produces water. Hence, in a dry season well manured soils, or those abounding in humus, suffer very little.

The evaporation from an acre of fresh-ploughed land is equal to 950 pounds per hour; this is the greatest for the first and second days, ceases about the fifth day, and begins again by hoeing, while, at the same time, the unbroken ground affords no trace of moisture. This evaporation is equal to that which follows after copious rains. These are highly practical facts, and teach the necessity of frequent stirring of the soil in the dry season. Where manure or humus is lying in the soil, the evaporation from an acre equals 5,000 pounds per hour. At 2,000 pounds of water per hour, the evaporation would amount in 92 days, that is, a growing season, to 2,208,000 pounds, an enormous quantity of water, too much to be permitted, however beneficial that evaporation may be. It is true that this evaporation is charged with carbonic acid, and acts on the silicates, eliminates alkalies, waters and feeds plants, but where irrigation is practiced, the evaporation is carried on with as good an effect beneath a mulch of finely pulverized soil through which it penetrates, if the land is properly prepared for and tilled after the application of water. This is a subject which demands careful study, so that the laws of nature may be as rigorously enforced when man takes them under his control, otherwise, there will always be failure. How to enforce those laws

without doing violence to the principles which underlie them, is matter which will be fully treated in future chapters.

In concluding this chapter, it is deemed proper to call the attention of the reader to this maxim which should never be forgotten: It is not the plants grown in a soil that exhaust it, but those removed from it. It is an undeniable fact, that the growth of plants in any soil is beneficial, inasmuch as it brings into play the forces of nature which are in constant motion toward increase through fertility. For ages, the great prairies of the West, and also the so-called "arid, and semi-arid" lands have been storing up humus which now needs but the application of water to convert them into lands that will laugh with rich harvests. Plant life has, for centuries, sprung into existence, reached maturity, and decayed, going back into the soil, with no hand to remove it. The consequence is, all these lands are rich in salts and humus, and it is left for the man with the ditch to add moisture, open the soil and admit oxygen to the seeds he plants, so that they shall be fed up to perfection and enable him to reap a glorious harvest.

The laws of nature are the same in this regard as to the man who looks to the heavens for his inconstant rainfall. There is for him to consider in the lands under ditch, that all soil has four important functions to perform, which are:

First.—It upholds the plant, affording it a sure and safe anchorage.

Second.—It absorbs water, air and heat to promote its growth. These are the mechanical and physical functions of the soil.

Third.—It contains and supplies to the plant both organic and inorganic food as its wants require; and

Fourth.—It is a workshop in which, by the aid of air and moisture, chemical changes are continually going on; by which changes these several kinds of foods are prepared for admission into the living roots.

These are its chemical functions. They all are the law and the gospel of agriculture, and all the operations of the farmer are intended to aid the soil in the performance of one or the other of these functions.

ILLINOIS HONORS McCORMICK.

Agricultural College Admits Name of Inventor of Harvester to Hall of Fame.

In recognition of his services as a contributor to the agricultural development of the country, through his invention and the perfecting of the harvesting machine, the Illinois College of Agriculture has admitted the name and portrait of Cyrus Hall McCormick to the hall of fame. There were many impressive features to the ceremonies on December 15 and among those gathered at Urbana to participate were the foremost statesmen and business men of Illinois.

That the event received recognition from the many workers in fields of scientific agriculture was indicated by the numerous letters received from foreign ministers of agriculture. These letters will be incorporated in memorial column to be kept at the College of Agriculture.

In speaking of Mr. McCormick, President A. P. Grout, of the Farmers' Hall of Fame Commission, said:

"This gathering, these exercises, mark an important epoch. It is the first recognition of the services of the men who have contributed largely to the growth of the country. To no one is the country more indebted in this respect than to Cyrus Hall McCormick. Farming has been transformed from laborious drudgery to a scientific industry.

"No invention probably contributed so much to this changed condition as the reaper. More effective means of harvesting called for a more scientific way of sowing. Mr. McCormick lived to see his invention recognized by all of the great nations of the globe."

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 280-page finely illustrated work for new beginners in irrigation.

THE CAREY ACT

How to Acquire Title to Public Lands Under The Act.

A Comprehensive Survey of the Regulations in Force in the Various States.

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(Member Executive Committee, Eighteenth Nat'l Irrigation Cong.)

Having pointed out, with a brief reference to the history of the federal "Carey" Act, the salient features of federal and state legislation, it will be interesting to trace the course to be pursued by both the company, and the entryman (or settler), as well as the methods followed, and regulations adopted, by the various states, in the control of these great estates.

The contract between the state and the "construction" company having been executed, the next step is to provide for the "entering" of the land by those who are qualified and who may wish to make use of their statutory rights. It is well, at this point, to emphasize the fact that the benefits of the Carey Act, in so far as they relate to the segregation of lands and the acquisition of title, insure in the same degree to the individual who may wish to construct his own irrigation plant to furnish water for 160 acres, or to an association of persons who may desire to co-operate toward this end, as to the corporation which proposes to sell water rights to hundreds of settlers. The principal causes for the development of large tracts by aggregations of capital may be found: First, in the physical difficulty of individual water diversion; second, the greater economy resulting from joint effort; and, third, the easy terms of payment upon which water rights, under the large canal systems, are sold.

Some small tracts have been taken up from time to time in Wyoming by individuals or by two or three combined, while the statutes of both Montana and South Dakota provide for state aid to associations of settlers who desire to operate in their own behalf. The statutes of all states provide for request for selection of lands upon the part of "any person or persons, company, firm, association or corporation." Since an overwhelming amount of the settlement occurs upon the larger tracts, irrigated under contract with large corporations, the statements herein made are to be construed as dealing with this class of operations, and, for convenience of nomenclature, the contractor is hereafter referred to as the "Company." Separate mention will be made of special provisions for "Associations" where their importance may justify it. The various statutes, rules and regulations governing the relations of the state, the contractor, and the settler, will be explained somewhat in sequence as they may become of importance in actual operations, and, as far as practicable, will be grouped together as they may deal with the land, the water, or the subjects of general importance.

Wherever the regulations are of a general nature, and, as between all the states, largely in harmony, they will be referred to without specific mention of each state—possible exceptions to the rule will be pointed out by individual mention. Distinct omission of the names of any state or states may be taken to indicate, either absence of statute or regulations governing the subject involved, or lack of data.

The official titles of the various governing boards, their constituency and post office address, together with the names of the principal official of the board are herewith presented.

IDAHO.

State Board of Land Commissioners—Governor, Attorney-General, Secretary of State, Superintendent of Public Instruction, Registrar of Land Department. Postoffice address, Boise; M. I. Church, Registrar and Secretary of Board.

WYOMING.

State Board of Land Commissioners—Governor, Superintendent of Public Instruction, Secretary of State. Postoffice address, Cheyenne; R. P. Fuller, Commissioner of Public Lands.

COLORADO.

State Board of Land Commissioners—Governor, Secretary of State, Attorney-General, Superintendent of Public Instruction, Registrar of Land Department. Postoffice address, Denver; R. L. Jefferson, Registrar.

UTAH.

State Board of Land Commissioners—Five resident citizens appointed by Governor, with consent of Senate, hold office two years. Postoffice address, Salt Lake City; Thos. C. Callister, Secretary.

MONTANA.

Carey Land Act Board—State Engineer, Secretary of State, State Examiner. Postoffice address, Helena; G. R. Davies, Secretary.

OREGON.

Desert Land Board—Governor, Secretary of State, Treasurer, Attorney-General, State Engineer. Postoffice address, Salem; John H. Lewis, State Engineer, is Secretary of Desert Land Board.

NEW MEXICO.

Carey Act Land Board—Governor, Commissioner of Public Lands, Territorial Engineer. Postoffice address, Santa Fe; R. P. Ervien, Secretary of Board.

SOUTH DAKOTA.

Carey Land Act Board—State Engineer, State Auditor, Commissioner of School and Public Lands. Postoffice address, Pierre.

Qualifications Necessary to Enter Land.

Any citizen of the United States, or any person having declared his intention of becoming a citizen (who must present a certified copy of his declaration of intention) may present a sworn "Application for Entry" to the board to "enter any of said lands," regardless of whether he (or she) may have exhausted, previously, all rights under the federal agricultural land laws.

Rights of Married Women.

Wyoming—Permitted to file.

Idaho and Colorado—Debarred from filing.

Montana—Permitted to file if the head of the family, through physical incapacity or incarceration for crime.

Oregon—Permitted to file.

Amount of Land That May Be Entered.

Settlers may take up 40, 80, 120 or 160 acres—160 acres being the maximum. Entries must be made in legal subdivisions of 40 acres unless the subdivision should be made to include a greater or less amount through railroad or canal right of way or similar causes.

One filing of a less amount than 160 acres may be succeeded by other filings in the same state, or in others, provided the maximum of 160 acres be not exceeded.

EXCEPTION.—Utah—The statutes provide that "no settler shall be entitled to make more than one entry."

Filings Subsequent to the First—Special Regulations.

Idaho—Regulations prohibit two or more entries at the same time, upon the same project, and prescribe that at least 60 days must elapse between applications by the same party, for non-contiguous lands, upon the same project; also, that, in case of a second entry, adjoining one already "proven up" residence and the erection of a dwelling be not required, provided the necessary amount of cultivation (of the second entry) be shown.

Lands Thrown Open to Public Entry—When and How Done.

In all states (except Montana, Oregon and South Dakota—see exceptions below) the statutes provide, substantially, that "upon withdrawal of land by the Department of the Interior and the inauguration of work by the contractor, it shall be the duty of the board of publication (usually once each week for four weeks in one newspaper in the county where land is situated, and in one newspaper in the state capital) to give notice that the land, or any part thereof, is open for settlement, the price at which land will be sold and the contract price at which the settlers may purchase water rights (shares in the works).

The "Rules" of Idaho, Utah, Montana and New Mexico provide, further, that "The lands may be thrown open from time to time as the construction proceeds and applications received to enter lands by entrymen after notice given," while the "Rules" of Idaho and Montana proceed, further, to prescribe that, "the throwing open of lands to entry or the approval of applications to entry, may, at the discretion of the board, be deferred until satisfied that water is actually available."

EXCEPTIONS.—Montana and South Dakota—The statutes provide that "Any person qualified may make applications at any time after the land has been classified."

South Dakota has inserted a further provision favoring strongly of the federal laws upon homestead settlement: "The claimant first settling shall have prior right to enter the land; provided, however, that, if any claimant shall fail, within 60 days after his settlement (upon classified land), or within 60 days after classification (if not classified when settled upon), to file his application to enter, and to make the necessary payments, his claim will be forfeited and shall be awarded to the next settler."

Oregon—The statutes provide that no land shall be open to entry until water supply is assured and the regulations provide (Rule 26. Sales—Contract with State): "No water rights can be sold until the works have been constructed to insure a water supply satisfactory, and the company directed by the board to proceed with such sales. Any land so open for entry and sale shall be subject to entry by application to the company." While Rule 15 provides that "no one shall enter until he has first entered into contract with the company for water rights."

The usual method of throwing lands open is by a drawing, under the supervision of the state authorities.

Applications for Entry—Approval of Entry.

In all states applications are required to be made out upon special blank forms, setting forth that the application is made "for the purpose of actual reclamation, cultivation and settlement—that the applicant has never received the benefits of the Act to an amount greater than 160 acres (including the amount specified in the application)." Such application must be accompanied by a certified copy of a contract for a perpetual water right, stating (with date) what entries, if any, have been previously made by the entryman.

"The board shall file the application and other papers and, if allowed, issue a certificate of location to the applicant. All applications shall be accompanied by a first payment of 25c per acre for the land—to be refunded in case the application is not allowed."

EXCEPTIONS.—Oregon—Statutes of 1909: Each application must be accompanied by a payment of not less than \$1.00 per acre to be made by contractor out of the applicant's first payment and to be returned if the application be not approved.

Wyoming, Utah, South Dakota and Montana provide, further, that where the company fails to furnish water under its contract, "the state shall refund to the settler all payments made to it."

All applications must be subscribed and sworn to before any officer having a seal and authorized to administer oaths. (The officer need not furnish certificate of his authority.) The filing fee exacted by all the states to accompany the application is \$1.00.

New Mexico statutes also provide that "whenever land filed upon under the homestead or desert land acts lies under and is susceptible to irrigation under any proposed Carey Act project, such land may, with the approval of the federal land office, be relinquished back to the government, and be re-entered under Carey Act provisions, and the board will allow the entryman the first right to file upon such land as it becomes available for entry."

In some of the states the company is permitted to exercise its discretion as to whether applicants are qualified to meet the required payment for water rights.

Some of the states also provide for the appointment of a representative of the board in the county wherein the lands are situated, before whom applications may be made. The usual method is to forward the applications to the company, which then files it with the board. This method is obligatory in Montana and Oregon. In most states the filing can be made by an attorney-in-fact, while in Wyoming, applications may be mailed to the commissioner of public lands, if accompanied by contracts and payments. This method, of course, cannot be pursued at drawings, where the presence of the settler, or of an attorney, or locator, is absolutely essential for a quick decision as to choice of lands. Where filings are made by an attorney-in-fact the settler is not required to leave his

home until within the statutory period after water is ready for delivery. In Montana all applications must be presented in person.

Protection of Settler's First Payment—Escrow and Company Bond.

All States—Company required to give penal bond in varying amounts "to secure the completion and execution of their contract."

New Mexico requires in addition (Rule 6) that "The company shall give a bond, conditional for the return of any money paid by settlers in case of abandonment or failure to perform its contract with the settler."

Montana provides that, "in every case where the company shall contract for the sale of water rights, prior to reclamation, it shall furnish additional bond, conditioned that unless water shall be available upon a date fixed by the board, all moneys paid by purchasers shall be returned with interest upon demand, after such date."

Idaho, Wyoming, Colorado and Utah provide that in all such cases the first payments and all papers shall be deposited in escrow with the board or with some trust company named by it under an agreement to refund the moneys to the settlers in case of failure of the company to complete its contracts.

The most obvious argument in favor of filings prior to reclamation is that it enables those applying first to secure the most desirable tracts and to prepare the land for reclamation and irrigation in advance of the completion of the canal, enabling them to make final proof and to receive patent in the minimum space of time.

Residence—When to be Established—Annual and Final Proof.

Idaho, Colorado, Utah, Montana and Wyoming—The applicant (with his family, if married) must establish residence within six months after notice that water is available, and within one year after such notice must cultivate and reclaim at least one-sixteenth of the entry, within two years not less than one-eighth of the entry, and within three years the settler must make "Final Proof" of reclamation, occupation and settlement or such final proof may be offered (at any time after one-eighth of the entry has been cultivated) at any time before the expiration of three years.

All of these affidavits are required to be sworn to before the secretary of the board or a designated representative of the board, and must be supported by the evidence of two witnesses; affidavit of the non-character of the land must be made at time of final proof, also supported by the evidence of two witnesses (this is required in all states).

"The entryman shall give notice of his intention to make final proof by publication in a newspaper in the county wherein his entry is located during the four weeks preceding the date set for making such proof." After final proof a certificate is given him by the official taking the proof which, in effect, is the same as a warranty deed. A duplicate of this certificate, together with the affidavits, are forwarded to the board and, if found correct and approved, a patent from the state is issued to the settler—provided the state has already received title from the federal government; if not, then the proofs are forwarded to the Department of the Interior, with the request that patent be issued to the state, upon the receipt of which the state issues patent to the settler.

Final proof must be accompanied by the unpaid balance of the purchase price of the land (25 cents per acre).

EXCEPTIONS.—Wyoming—Entryman permitted to defer settlement upon condition that he make final proof within 1 year after notice of water showing reclamation of one-half of the land and continuous residence within the thirty days immediately preceding such proof; the statutes of Wyoming also provide that any qualified person having resided in the state three years, continuously, may enter land in the vicinity of his residence, and secure title by cultivation merely, and without the need of residence.

Final certificates are not issued in Wyoming but, in lieu thereof, the settler is given a receipt for his final payment.

New Mexico—"Within one year after notice of water
(Continued on page 135.)

NEW MEXICO BUREAU OF IMMIGRATION.

The Legislature of New Mexico acted wisely when eight years ago it created an official body, to be known as the Bureau of Immigration, to consist of six members appointed by the Governor bi-ennially, subject to ratification by the Legislature, and with authority to employ a permanent secretary, the mission of the Bureau being to gather and to disseminate reliable information concerning the territory and to advance its interests generally through proper channels of publicity.

Men of high standing in the territory have served upon this Bureau and the high character of its work attests to the interest displayed in this voluntary service of the Territory.

The position of Secretary, the responsible official of the Bureau, was held during the first four years of its existence by the late Col. Max Frost of Santa Fe, whose recent death served to remind the public of this man's genius, which triumphed over the obstacles of total blindness and partial



H. B. HENING,
Secretary New Mexico Bureau of Immigration.

paralysis. When, four years ago the weight of infirmities caused Col. Frost to resign his commission, the Bureau faced the problem of finding a man measuring up to his intellectual standard. H. B. Hening was finally decided upon and the brilliant work performed by him since his appointment has amply vindicated the choice of the Bureau. He possesses in a rare degree the faculty of presenting facts and statistics in a manner which makes them entertaining reading even to the indifferent.

Mr. Hening was born in Missouri, and secured his education at the University of Syracuse, New York. After his graduation some nine years ago, he removed to New Mexico, where he became a range rider. Perhaps for lack of intellectual stimulus he forsook this life and devoted himself to newspaper work, from which field of activity he was chosen to fill his present position. He was in direct charge of the exhibit of his Territory at the recent Land and Irrigation Exposition in Chicago, and was largely responsible for the creditable display made. Mr. Hening made the following

statement to a representative of the IRRIGATION AGE relative to his Territory:

"During the past three years New Mexico has attained the record of growth in citizenship, 40,000 homestead entries having been made during that time, upon 6,000,000 acres of public land. Our water resources for irrigation and power are very largely unappropriated, and under the able administration of Mr. V. L. Sullivan, Territorial Engineer, investigation of these are being consistently pursued with the co-operation of the United States Geological Survey. Within two or three years the water resources of the State will have been adequately charted. Reliable estimates place the amount of water available for irrigation as sufficient for two million acres, including the half million under completed works, or those under construction. Applications for water sufficient for one-half million acres more have been approved, including one Carey Act project—the Urton Lake project of 40,000 acres, the first Carey Act project in the Territory. In addition to this enormous total, applications sufficient for fully 1,500,000 acres are on file, but are not as yet approved. Mr. Sullivan estimates that approximately 75,000 acres in the vicinity of Deming, 25,000 acres in the Estancia Valley, 50,000 acres in the Pecos Valley, 50,000 acres about Portales, and 100,000 acres in the Rio Grande Valley are capable of reclamation through pumping. Pumping projects to reclaim land around Deming and to the extent of 6,000 acres near Portales are now under construction. The figures quoted before, relative to irrigation, include the Government's Rio Grande and Carlsbad projects, both of these being storage propositions.

Of interest is the announcement that a company of Italians headed by the grandson of Garibaldi, have applied for water sufficient to reclaim 50,000 acres of Mesa land east of Albuquerque, with a storage dam at the mouth of Hain's Cañon.

"In eastern New Mexico, the boundaries of the Pecos Valley Artesian belt are well defined by the sand dunes on either side. The area embraces a total of 450,000 acres, of which 160,000 are under irrigation from canals and artesian wells, the proportion of each being about equal. This artesian flow has been under continuous official observation for the past four years, and where wells have been properly cased no diminution in their flow has been observed. The use of the water is under stringent regulations, and no waste of it is permitted. All of the land in this area is under private ownership, and is sold at reasonable figures.

"The Government's Carlsbad project, of 20,000 acres, has been in successful operation—16,000 acres having been cultivated this year. The balance comprises so called "excess holdings," the raw lands of which are upon the market at from \$60 to \$75 per acre. It is now proposed to increase the capacity of the reservoir to serve an additional 10,000 acres.

"In the Rio Grande Valley the entire 25,000 acres served by the Leasburg dam were under cultivation, with excellent results this year.

"As to the land grants in New Mexico, all of those having a recognized existence have been confirmed by Congress under decision of the court of Private Land Claims, these decisions sustaining the title of all known heirs from the original grantees. An adjudication by the local courts to sustain the rights of living heirs in making assignments is all that is necessary now from a legal standpoint in securing a title to any of these grants. This is a comparatively easy matter and many of the heirs are disposing of their holdings upon a reasonable basis.

"Eastern investors are beginning to pick up these fine large tracts of land which offer cohesive holdings, and which are unique upon the land map of the United States. The title to some of these grants includes available appropriations of water.

"Some of these purchases are being made for investment, others for the purpose of immediate development. One of the largest grants including 500,000 acres was sold in this manner recently."

MYERS' 1910 CALENDAR.

Among the many calendar posters sent to the office of the Age during the past month, that issued by F. E. Myers & Bro., manufacturers of pumps, hay-tools, etc., at Ashland, Ohio, deserves special mention. A representative of the company states that more than 30,000 of these have been mailed to dealers handling Myers' goods. The company has spared no expense in designing and printing the calendar and it verifies the claim of the largest manufacturer of domestic pumps and hay-tools in the United States.

SOME POINTED ADVICE BY AN EXPERT.

If the man who causes two blades of grass to grow where only one grew before is a benefactor, then surely Alexander McPherson, the subject of this sketch and the "best known" man in Idaho, is entitled to nothing short of a niche in the Hall of Fame. This Nestor of southern Idaho is a native of Illinois, and removed to Idaho twenty-three years ago.

Mr. McPherson has probably been instrumental, during these many years of activity, in causing more blades to sprout upon the arid plains of southern Idaho where *none* grew before than any other man, of whom we have record.

Incidentally it may be remarked that Mr. McPherson is the father of three bright sons (total length eighteen feet) as emphasized by him, one of whom has followed his father's example by becoming a farmer, and who has literally "put it all over his father" at the last Idaho State Fair; one a civil engineer, while the third is yet attending school. If the McPherson family ever adopts a coat of arms, it can



Alexander McPherson.

most appropriately be surmounted by a sheaf of alfalfa. "Plant alfalfa, then alfalfa and then more alfalfa" is Mr. McPherson's slogan. "Then you may turn it under and thus enrich the soil to a degree that any crop suited to this zone will thrive phenomenally."

When Mr. McPherson first went to Idaho there was but one irrigation ditch in that state—the Ridenbaugh ditch in the Boise Valley. He has been identified with the irrigation interests of Idaho for twenty years, during all of which period he has been in the employ of the State, conducting experimental horticultural and dairy work. He has acted as the Agricultural Adviser upon many of the Carey Act projects of southern Idaho, including the various Twin Falls projects, Salmon river, Big Wood river, Big Lost river, Medbury and Boise Valley projects. Upon the Twin Falls tracts he organized the Farmers Associations for education through the medium of public meetings, held nightly, and by practical work upon demonstration farms during the day. Under this system inaugurated by Mr. McPherson, he states, "Every settler on the Twin Falls south side project 'has made good.' There is no reason why the same results should not be accomplished on all the more recent projects." Mr. McPherson has latterly extended his activities to embrace other states.

WYOMING AND ITS RESOURCES.

The state of Wyoming is entering upon a period of rapid and wholesome development along many lines of activity. Especially is this evident when considered in the light of what has been accomplished under the provisions of the Carey act, as interpreted by the land board.

Wyoming has long enjoyed the enviable reputation of possessing both a model code of Irrigation Laws and a supply of water for power and irrigation purposes sufficient to provide for the needs of the State for many years to come. These facts, combined with able management of its land and water resources, have attracted investment-seeking capital as well as settlers in great numbers.

Mr. R. P. Fuller, commissioner of public lands, and Mr. Clarence T. Johnston, state engineer, are in high esteem, throughout the west, for their efficiency and integrity. Both of these gentlemen attended the National Farm Land Congress at Chicago. Mr. Johnston returned at the close of the session to Cheyenne, while Mr. Fuller repaired to Washington, D. C., on business matters. Upon his return to Chicago on his way home, Mr. Fuller was consulted by a representative of THE IRRIGATION AGE. Speaking of his State, Mr. Fuller remarked:

"The agricultural sections of the state are being settled up rapidly, and, what is most gratifying, by a superior class of men, mostly farmers, and of American birth—the great majority of them coming from the middle west. The Carey Act projects are attracting many of the more intelligent, who realize the importance of adequate water supply and the measure of protection which the state affords to settlers."

"Wyoming irrigation projects being relatively smaller in area than those of other states, have not proven attractive to the speculative entryman, but this is rather a blessing than otherwise, as their absence clears the way for the bona fide settler, whose energies we need."

"As the abundance of the water resources of Wyoming become better known to financiers generally, we may justifiably expect an increasing flood of eastern capital to unlock the treasures of our State. Notwithstanding the number of irrigation projects now completed, or under construction, the normal flow of our streams in the aggregate has not begun to be fully appropriated, and when, in time, it is, there will still remain adequate storage facilities to be utilized."

"However, my recommendation is, that no power or irrigation project should be undertaken without complete engineering investigation and data."

"Wyoming is fortunate in two respects. First, by reason of its abundance of unappropriated water; second, because our law-makers, profiting by the example of other states, legislated wisely for distribution of waters, so that the entanglements of over-appropriations, and of conflicting interests manifest in some other localities, are not to be feared."

"No one can secure a property interest in our waters; they belong to the State, and all that the appropriator is granted is an easement or the right to the use of as much water as he can apply beneficially. A license is granted, not for the amount of water that is applied for, but for the amount that is actually put to beneficial use as an adjudication may determine, if necessary. Our water rights cannot be sold, neither can they be transferred from one tract to another."

"In the aggregate there are now seventy-six Carey Act projects either segregated or in process of segregation, averaging from 30,000 to 50,000 acres, each, but there still remains room for many more."

"Our agricultural lands lie at altitudes averaging from 3,500 to 6,000 feet and are suited to all the crops of the Temperate Zone."

"Railroad development will take place rapidly within the near future—the Burlington Railroad has commenced actual construction upon its north and south line, from the old road, beginning on the Northern Pacific, near Billings, to Worland, and thence south to a connection with the Colorado & Southern, 150 miles north of Cheyenne, thence to Cheyenne. This means much to the State, as it will afford the fruitful Big Horn Basin, and the lands under the Shoshone project of the Federal Government, a direct outlet to Colorado, Texas, and the Gulf Sea Board, over the Hill lines. We have every reason to be satisfied with the outlook."

Reclamation Notes

COLORADO.

Stockholders in the Grand Valley Irrigation Association held their annual meeting recently at Grand Junction. Directors were re-elected and reports show that the year has been prosperous.

The county commissioners have authorized the organization of the Platte Valley Municipal Ditch near Greeley. Land involved in this organization lies on the east side of the Union Pacific tracks between Brighton and Platteville.

Cincinnati capitalists are said to be financing the Florida Irrigation Company which will include the Pennington Lake reservoir site and the Farmers' Enterprise, and other ditches near Durango. About 22,000 acres are contained in the proposed system.

Land owners in the Mesa County and the Palisade Irrigation Districts recently held an election to decide on proposed bond issue of \$176,000 for the construction of diverting dam across Grand river above Palisade. These bonds will be equally divided between the two districts.

In connection with the projected consolidation of the irrigation systems known as the Teller Reservoir, the Canyon City, the Florence and the Pueblo Water Company, it is stated that the Teller Reservoir Company has decided that its plans are too far advanced to admit of a combination.

The Fountain Valley Land and Irrigation Company has recently authorized the issuance of \$500,000 for improvements in its property near Fountain. It is stated that the company has already expended one million dollars in this work, and that the new bond issue will result in reclamation of additional acreage.

E. L. Tebow has brought suit against J. C. Teller, John Olsen and William Olsen, doing business as the Olsen Construction Company, for the sum of \$60,000, which he claims to be due him for his interest in the Turkey Creek Reservoir. Tebow claims that he filed on this site many years ago and that the Construction Company has usurped his rights.

District Judge Rizer, in court at La Junta, recently decided that the proposed bond issue of \$650,000, voted by the Holbrook Irrigated district, is valid. It is reported that farmers will take bonds to the amount of about \$400,000, and that the remaining \$250,000 will be placed on the market. The district is comprised of 20,000 acres, lying about five miles from La Junta.

Promoters of the Bent County Reservoir Company have filed plans with the state engineer, showing the site of the reservoir to be in Bent county and the supply of water to be taken from Rule Creek. By the construction of a dam at a cost of \$200,000 there will be stored about 150,000 acre feet. To complete the entire system bonds to the amount of \$650,000 will be issued.

Petitions for the new Hardscrabble Irrigation District in Fremont county have been generally signed by land owners and it is claimed that a majority of the district is now represented. Several surveys have been made with a view to filing on the waters of Hardscrabble creek and other available reservoir sites. It is proposed to issue bonds for necessary construction work.

Farmers of the Otero Irrigation District held a meeting recently and nominated the following directors: Frank Taylor, R. W. Norton, D. A. Bole and M. W. McIntyre. George Anderson, a civil engineer of Denver,

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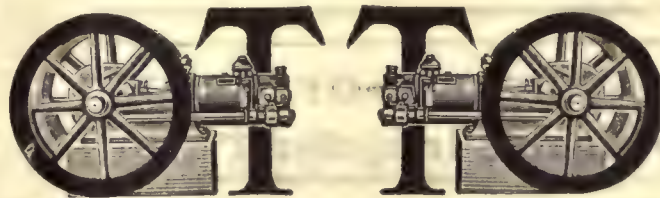


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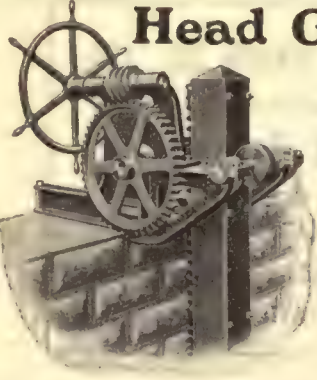
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has been retained to make surveys for improvements.—It is proposed to construct a reservoir on Anderson arroyo, for which the company has voted \$150,000 in bonds.

John T. Warren, of Greeley, is soon to launch a project involving an estimated expenditure of approximately \$11,000,000, and calculated to reclaim 1,000,000 acres in Morgan, Logan and Washington counties. In an interview Mr. Morgan stated that the company plans to build a dam across the narrows of the Platte river about six miles below Weldon. The capacity of this reservoir will be 1,000,000 acre feet.

Early last month it was rumored that the Beaver Land and Irrigation Company, operating in the vicinity of Beaver creek, west of Pueblo, had been consolidated with the Canyon City, Florence and Pueblo Water Company project. General Manager Matlock, of the former company, denies that there have been negotiations for such consolidation, and states that his company is preparing to increase its acreage.

Through the agency of Dall De Weese and others a meeting of land owners in the vicinity of Canyon City was held in that city under the auspices of the Canyon City, Florence and Pueblo Water Company. Mr. De Weese and others, interested land owners in the project for the reclamation of 300,000 acres in the Arkansas valley between Canyon City and Pueblo. It is proposed to invest about \$8,000,000 in construction work.

Upon application of Gerald Hughes, La Fayette Hughes, J. I. Case of Milwaukee, the state has recently granted rights on a 144,000 acre tract north of Hayden, on the line of the proposed western extension of the Moffit road. The new project is known as the Traveler's Lake and Yellow Jacket Irrigation Company. It is proposed to build a series of reservoirs to impound 210,000 acre feet of water from the White river, which will be brought over Yellow Jacket pass.

A. E. Bent of Lamar is said to be heading a movement to organize the territory on the north side of the Arkansas river between Las Animas and Wild Horse creek, involving about 100,000 acres. He plans to complete the Mammoth reservoir site on the Purgatoire river, and also to construct a reservoir thirty miles below Trinidad. Providing the organization is carried forward rapidly, Mr. Bent predicts that the construction work will be completed before the spring of 1911.

The Colorado State Land Board has recently heard a protest of the Bent County Reservoir Company against the Carey Act segregation asked by the Valley Investment Company. The latter company wants rights on 24,000 acres of land in Bent county, but the reservoir company states that if this right is given the supply for its project will be inadequate. State Engineer Comstock is of the opinion that there is enough water for the irrigation of 24,000 acres by the Valley Investment Company and 10,000 acres by the Bent County Reservoir Company.

H. W. King, a civil engineer of Chicago, is reported to be arranging the details for a consolidation of numerous projects in the west end of Montrose county. Aside from combining numerous small districts containing approximately 50,000 acres, the projected company proposes to take water from the Dolores river near Rico and reclaim about 50,000 additional acres by the construction of reservoir and canals. The reservoir will supply water for lands in the East Paradox valley. Present capital of the small companies aggregates \$75,000, and it is estimated that not less than \$300,000 will be required for improvements.

Through negotiations closed at Denver recently it is announced that the Herylyn and the Golden-Littleton irrigation systems have been transferred to the Camfield Development Company, in which David H. Moffit, Wm. G. Evans, J. K. Mullen, Gerald Hughes, D. C. Camfield and other Denver capitalists are interested. Lands comprised in these two districts are located within a radius of forty miles of Denver and aggregate 125,000 acres. Bonds to the amount of \$432,000 have been issued by the District and the Camfield Development Company secured control through the purchase thereof. About 100,000

acres lie in the southern part of Weld county, while the remaining 25,000 acres are near Denver along the line of the Burlington railway.

Articles of incorporation for the Royal Gorge Irrigation Company have been filed at Denver, showing incorporators to be capitalists of Colorado Springs, and the capital stock to be \$500,000. It is proposed to reorganize the Lida irrigation and Lida reservoir systems, and to complete their construction by six supply ditches. Water will be taken from the Arkansas river and Ten Mile creek and various small tributaries of the Arkansas. A canal sixty miles in length will convey water into Freemont and Pueblo counties, where much of the land lies. The board of directors is as follows: Thos. F. Daly, Geo. B. Tripp, Jas. R. Moore, A. Sutton, F. Gilpin, D. F. Carpenter and Henry C. Hall. The principal office of the company is at Colorado Springs, Colo. Of the five thousand shares of capital stock five hundred are preferred, and bear interest at the rate of 6 per cent.

CALIFORNIA.

To secure an appropriation of \$400,000 from Congress for the improvement of the Sacramento and San Joaquin irrigation project, state officials have directed requests to their representatives at Washington asking that they co-operate to this end.

Engineers working in the interest of the Putah Creek Irrigation Company have nearly completed their work, and the company is planning condemnation of lands and other steps necessary to the construction of its canal to water 60,000 acres in Yolo and Solano counties.

It is reported that the old Tulloch irrigation system, lately controlled by the San Joaquin Canal and Irrigation Company, has been offered to the new Oakdale irrigation district for \$650,000. This offer includes the entire system except the power plant at Knights Ferry.

At the annual meeting of stockholders held at Gledora it was decided to reduce the water rate from four to three cents per hour inch. Directors were elected as follows: W. B. Gildden, president; C. C. Warren, Chas. F. Gordon, F. H. Harwood, E. E. Gard, T. C. Shiffman and W. G. Hall.

Secretary Eddy of the Stockton Chamber of Commerce has been instructed to investigate the feasibility of storing water in a reservoir in the Calaveras County canyon. The United States Geological Survey has made investigations. Water thus stored could be used for the irrigation of arid lands in this vicinity.

E. A. Wiltsee of New York recently laid before the directors of the Modesto and Turloch districts a plan for storing water in an immense system of reservoirs in Tuolumne canyon. He proposes an expenditure of about \$470,000 for a 160-foot dam at a point seven miles up the river from the present diverting dam. Water thus stored is to be used for both irrigation and power purposes.

IDAHO.

At a recent election in the Pioneer Irrigation District at Caldwell, Arthur G. Street was selected as director over G. T. Morse.

J. E. Lane of Blackfoot states that he has financed the Salmon River Land and Irrigation Company, which propose to reclaim 5,000 acres in Custer county.

The Idagon Irrigation Company has completed its dam in Jump Creek and is building 20 miles of laterals to cover 50,000 acres around Homedale, and in western Oregon.

Prominent citizens of Roswell have made plans for the reclamation of a 2,000-acre tract known as Roswell Park. To secure water from the Riverside ditch, a 4,500 feet inverted siphon will be constructed.

S. G. Yerkes, general manager of the Southern Idaho Reclamation Company, states that his company has no connection with the Great Western Beet Sugar Enterprise. The company proposes to construct a reservoir on the Long Tom basin, and it is to this fact that there was report of connection between the two companies. Recently the Southern Idaho Reclamation Company was

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The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
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granted a segregation of 67,000 acres in the Sunnyside district.

Land owners under the Canyon Canal Company's project have applied to the State Land Board for the enforcement of the terms of the contract between the state of Idaho and the Trowbridge & Niver Company. In their complaint they assert that construction work is inferior and canals insufficient in capacity to supply water. They state that there has been a depreciation of \$500,000 in land values within five months, owing to loss of crops and discouragement of settlement. Chairman R. B. Wilson of the water users' committee, was accompanied by a delegation of prominent Emmett citizens when the appeal was taken to the Land Board. The complainants pointed to the fact that the difficulties are set forth in the report of C. C. Stephenson as filed with the State Board. Water users stated that their efforts to secure recognition from the Trowbridge & Niver Company met with unsatisfactory results.

MONTANA.

Grading operations have been suspended for the winter on the government's Milk River project. The greater part of the cash contracts were completed before suspension of operations, and with one exception all cash contracts can be completed in a short time after operations are resumed in the spring.

On the Fort Shaw unit of the government's Sun River project betterments and maintenance work closed down about the middle of the month on account of cold weather until spring. The east and west ends of the unit are ready for another season's service, and but little work is required in the middle of the unit, which can be finished easily prior to any call for water. During the winter advantage will be taken of the frozen condition of the ground to haul rock to strengthen prospective works along the river bank.

John R. Hedley of Butte, said to be representing Denver capitalists, has filed on the water of Red Rock and

Beaver Head rivers to the amount of 5,000 second feet. According to the plans of Mr. Hedley a ditch will be constructed on the east bank of the Red Rock river about two miles southeast of Armstead, a point twenty miles south of Dillon. Water will be conducted down this canyon to Beaver Head valley and along a canal which will be about forty-five miles in length. Estimates call for the expenditure of approximately \$2,000,000. The land to be reclaimed will aggregate about 30,000 acres. The company proposes to purchase the Lima dam and to enlarge the structure to give an adequate water supply.

NEW MEXICO.

Reports from Las Vegas stated that final arrangements have been made for proceeding with construction work on the Camfield Reservoir project. The company conferred with the board of trustees of a Las Vegas grant and arranged a definite basis of procedure.

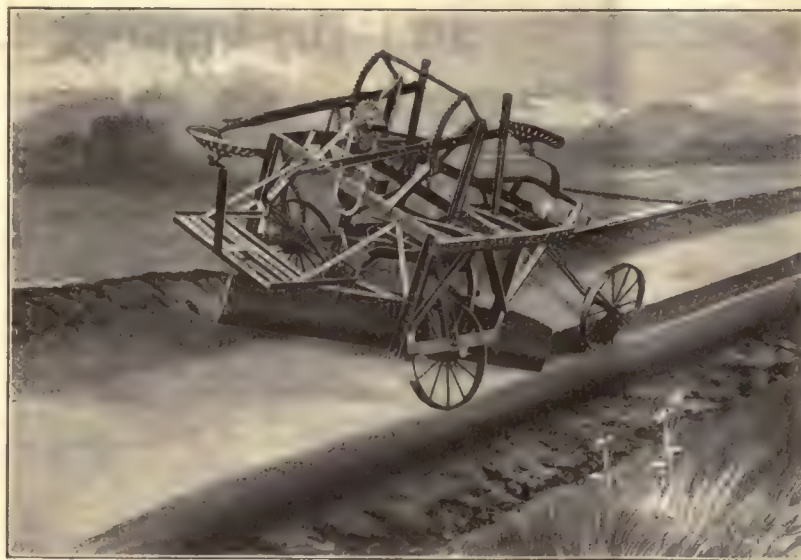
Business men at Roswell have conferred with J. L. Norton, of Chicago, with a view to the construction of a dam on the Rio Penasco. It is proposed to generate current for lighting in the Pecos valley and to supply power for pumping water to irrigate a tract of approximately 100,000 acres.

The Oasis Development Company has applied for the segregation of 30,180 acres in Otero county. It is proposed to take waters from the Sacramento river sixty miles south of Alamogordo and convey the supply to a reservoir through a natural arroyo. An earth embankment 5,810 feet long is proposed. The cost is estimated at \$175,000.

The auction sale of excess lands under the Carlsbad

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irrigation project, which was scheduled to take place on February 15, 1910, has been postponed until February 21. The railroads have arranged for homeseekers' excursions from the east on the 1st and 15th of that month, and it is desired to hold the sale on such a date that it may be attended by persons taking advantage of the excursions.

The Secretary of the Interior has authorized the execution of a contract with the Elephant Butte Water Users' Association for the delivery of water to the association for the irrigation of certain lands under Leasburg division of the Rio Grande irrigation project. The object of the contract is to provide for the delivery of water temporarily under a rental basis pending preparations for the formal opening of that portion of the project under the terms of the Reclamation Act. The contract will expire December 31, 1910, or at an earlier date.

Articles of incorporation have been filed at Santa Fe by the Portales Irrigation Company, and the San Antonio Improvement Company, showing a capitalization of \$875,000 for the former and \$100,000 for the latter. The Portales company has headquarters at Portales, Roosevelt county, and Thos. J. Molinari is agent. Seth A. Morrison, Geo. L. Reese, Hobson F. Jones, Washington E. Lindsey, John A. Fairley, Thos. J. Mola and Robt. Hix are directors. The latter company has headquarters at San Antonio and following are directors: Agnes E. Allaire, L. R. Weber, P. A. Allaire, Powell Starkhouse, Jr., and Wm. Watson.

For the third time the Supreme Court of the United States has given a decision in the litigation over the Rio Grande Dam and Irrigation Company. The court declares the company's charter to be forfeited. It is believed that this decision will end the litigation. In the case was involved the right of the company to construct a dam for irrigation purposes across the Rio Grande at Elephant Butte, where it was proposed to create the largest artificial lake in the world. The decision is based upon the fact that the construction work would violate the treaty between the United States and Mexico and would obstruct navigation.

OREGON.

During a recent flood in the Orgue river the pumping plant near the Ament dam was seriously crippled, with a considerable financial loss. The plant supplied water for the local irrigation district.

The Hermiston Engineering and Railroad Company of Hermiston was recently organized to irrigate 6,000 acres of high bench land adjacent to the Umatilla project. Artesian wells will be used. A. R. Ruffner is president and E. Ruffner, secretary.

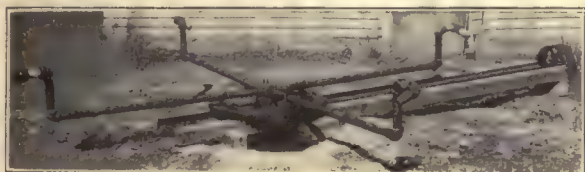
Owing to successful tests with artesian wells in the Wild Horse county, north and south of Andrews, many farmers are now turning their attention to this plan. It is claimed that numerous wells will be sunk during the coming year.

The Cottonwood West Creek Irrigation Company of Vale is planning the reclamation of 15,773 acres, twenty-four miles west of that city. The dam will be four miles west of Westphall, and will impound sufficient water to irrigate 25,000 acres. C. H. Oxman, E. L. Clarke, W. W. Caviness and Geo. B. Hayes of Vale are interested.

Spokane capitalists are said to be interested in the Marion Irrigation Company and the Tualatin Irrigation Company with a combined capital of \$300,000. John A. Finch, Chas. Hussey, Cyrus Happy, Harl J. Cook and W. L. Benham are stockholders. It is proposed to develop about 40,000 acres in western Oregon and lying for several miles along the Willamette river, south of Portland. Officers of both companies will be the same.

Land owners under the former government's Malheur irrigation project have formed themselves into two organizations and have requested the creation of two districts. One lies south of the Malheur river and along the Owyhee river to the state line of Idaho, and it is said that arrangements have been made for the construction of a system of reservoirs and canals. Both districts propose to use the same system for supplying water.

The Hood River irrigation district having about 6,000 acres in the Hood river valley, proposes to issue bonds



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to the amount of \$40,000 and extend its canal from Deadpoint creek to Greenpoint creek. About 2,000 acres will be reclaimed by this work. W. R. Winans, who proposes to build an electric line, has filed on water rights in this vicinity and it is claimed that if these are granted the aims of irrigation promoters will be defeated.

It is reported that the Desert Land Board has advised the Southern Irrigating Company, operating near Salem, to make a topographical survey of its segregation and take steps to secure a reservoir site. There has been some question as to the legality of the company's claim, and it is now believed that these matters are adjusted, and work will proceed. In the notice given to the company it was stated that unless work is completed as outlined the land shall revert to the state.

The Umatilla project is now 86¾ per cent completed. It represents to date an investment on the part of the government of \$1,138,425. The canal system is constructed so as to irrigate at the present time approximately 15,000 acres out of a total of 23,171 acres. The government has recently notified settlers that on January 15, 1910, all patented land within the first and second units of the project for which water right application has not been made in the local land office, in accordance with public notices then in force, shall be excluded from the project and appropriate steps shall be promptly taken to add to the project other lands equivalent in the irrigable area. Appropriate notices, at that time, will also be given by the department to the water users' association regarding the exclusion of such lands so that water right subscriptions therefor may be cancelled.

UTAH.

The Newcastle Reclamation Company has filed an application for rights on Shoal creek to irrigate about 5,000 acres in Washington county.

At the annual meeting of the Nephi Irrigation Com-

pany at Nephi, Jos. E. Iron was re-elected and Chas. Hall was elected as a new member of the board.

The Beaver Land, Irrigation & Power Company will have an opening of 12,000 acres in Beaver county early this year. Construction work is nearing completion.

H. A. Tyson and W. M. Gibson, of Chicago, have recently inspected land along the Utah-Wyoming border that can be watered from the tributaries of the Green river.

The Buckhorn Irrigation Company, having about 30,000 acres in Emery county, is planning to start active work on storage reservoirs in the near future. The cost is estimated at \$400,000.

Land owners in Juab county are planning to irrigate 14,000 acres in that district by expanding the Hatchtown reservoir in Garfield county, 150 miles distant. The dam is to be constructed at a cost of \$165,000 and land owners believe it feasible to send water down the Sevier river to be taken out in Juab county.

The Torrey Irrigation Company of Torrey, Wayne county, has filed amended articles of incorporation showing the capital stock to be \$42,000. Directors of the company are L. M. Schaffin, Jas. Huntsman, Wm. Smith, W. C. Smith, J. A. Hancock, A. E. Pierce and W. E. Lee. The company owns water rights and an irrigation system near Torrey.

W. F. Scheffel of Twin Falls, ex-Senator Frank Pettigrew of South Dakota and Geo. A. Dodge of Chicago have recently returned from an inspection of the plans of the Sevier River Land and Water Company, a concern that proposes reclamation of 200,000 acres in Millard county, about 125 miles south of Salt Lake City. It is reported that lands and water rights have been secured. Baron Hirsch of Hamburg, Germany, is alleged to have outlined this project about ten years ago. By damming the river near Lynn Junction the company proposes to create a reservoir from which thirty-five mile ditches will convey the water to lands near Oak City and Holden.

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WASHINGTON.

The Wenatchee Canal Company, owning a high line ditch in the Wanatchee valley, proposes to expend about \$100,000 in extending its system. A 5,000 foot tunnel through Cashmere Hill is proposed. Additional ditches and flumes will cost about \$20,000.

Wm. R. King, promotor of the Klickitat project, asserts that \$750,000 has been subscribed for the construction of the irrigation ditch fifteen miles northeast of Husum. He states that preliminary work on the Klickitat river for the drainage of Camas lake has been started.

Numerous damage suits against the White Bluffs Land & Irrigation Company and its associated water company have been filed at Prosser. Plaintiffs ask the appointment of a receiver because the company has failed to supply water as per contract. Land embraced in the White Bluffs project aggregates 2,000 acres.

Water contracts are being submitted to land holders in the district covered by the Horseheaven irrigation project near Bristol. Eastern capitalists are said to be willing to finance the work as soon as a sufficient number of contracts are signed. The company, known as the Big Klickitat Irrigation & Power Company, has completed preliminary surveys for a main canal 100 miles in length. Contracts allow fifteen years for payment of water rights.

Upon order from the Secretary of the Interior there has been withdrawn from all forms of entry, excepting any tracts already withdrawn under departmental order of September 8, 1904, and also any tracts the title to which has passed out of the United States, the following described lands in the Yakima project, Willamette principal meridian: T. 20 N., R. 13 E., NE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 10; NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 10. T. 21 N., R. 12 E., all Sec. 10; S $\frac{1}{2}$ Sec. 11; NE $\frac{1}{4}$ and S $\frac{1}{2}$ Sec. 12; all Secs. 13 and 14; N $\frac{1}{2}$ Sec. 15. T. 21 N., R. 13 E., all Sec. 7; NW $\frac{1}{2}$ Sec. 18; SE $\frac{1}{4}$ Sec. 34. These lands are required in order to provide for additional storage on Lake Nuchess, and also for the development of the spillway and proposed feeder canal from Lake Keechelus.

(Continued from page 126.)

being available, settler shall cultivate and reclaim not less than one-eighth of his entry and within two years shall appear before (the official designated) and make final proof, showing actual settlement and cultivation of at least one-eighth of his entry and make the final payment of 25 cents per acre for the land." Mention is made of the final certificate and the rules for patent are as above recited. No mention is made of the obligations of a married man to reside with his family. The depositions of two witnesses is required with all proof.

Oregon—The regulations provide that "the settler shall within three years from date of his application make proof of reclamation, settlement and residence for three months (with two witnesses) and file the same with the state land board at Salem," or as an alternative, that "Proof may be made upon showing of only 30 days' residence (with his family, if married), the cultivation of three-quarters of the entry, and the erection of a substantial house of at least four rooms. Either proof may be offered at any time before the expiration of the three-year period." The statutes provide: "Upon filing with the board satisfactory release of the company's lien against land of any applicant, it shall be the duty of the board to issue deed for the same."

South Dakota—The statutes make no provision for final proof, but they state that "after the state has received a patent for the land and a purchaser has paid for it in full, the board shall execute and deliver a deed to him."

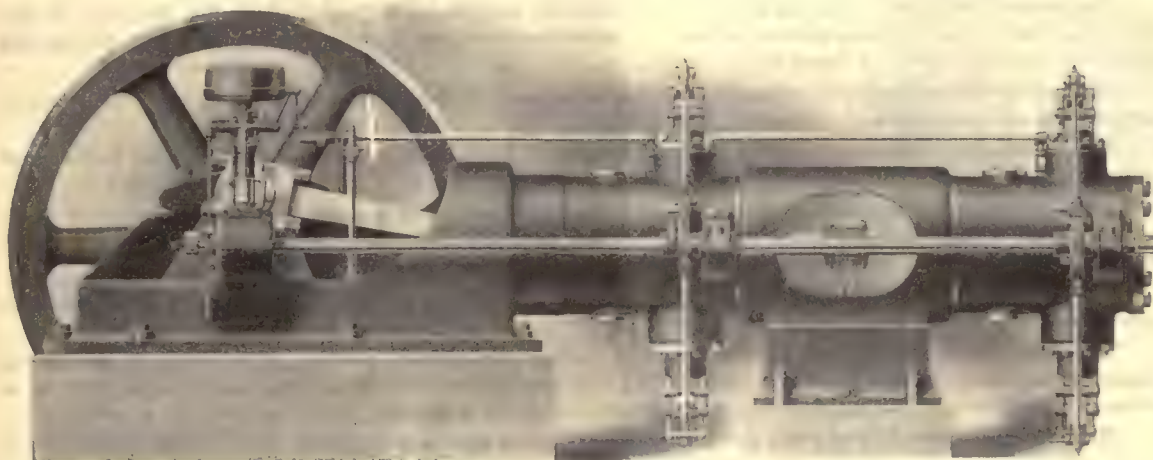
In General—While the regulations of some of the states make no mention of the obligations of a married man to reside upon his entry with his family, it is to be assumed that such a requirement will be made. All the affidavits herein referred to are executed upon blank forms, which are practically identical (as are the various fees) in all states.

The fees are as follows:

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For taking evidence of annual proof, \$1.50.

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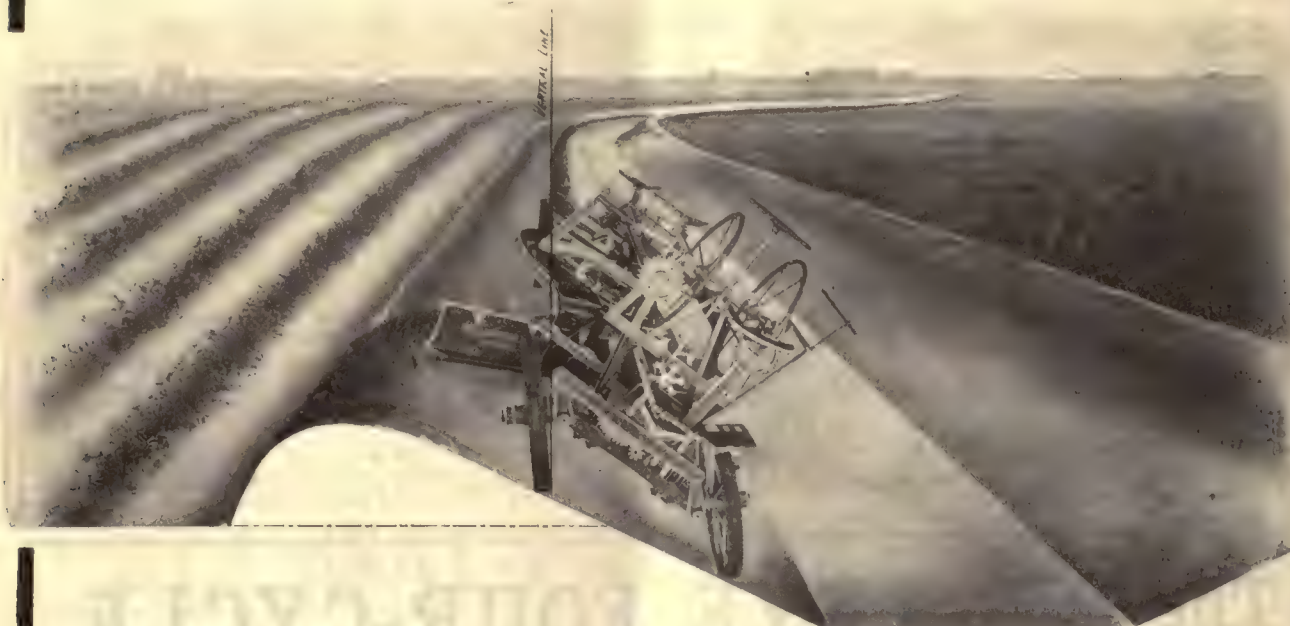
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It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

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MISCELLANEOUS.

The Chamber of Commerce at Globe, Ariz., is interesting itself in the San Carlos irrigation project. It is proposed to assist in organizing a company for construction work.

At a cost of \$200,000 a company proposes to construct an irrigation system in Finney county, Kansas. Contracts for water are now being signed and it is proposed to have the system ready for operation on May 1, 1910.

The Vegas artesian water syndicate of Vegas, Nev., has recently interested Judge Kenneth M. Jackson, and it is proposed to sink artesian wells for irrigation purposes. About 28,000 acres are now under control of the company.

Work is now progressing on the irrigation system in the vicinity of Lake Wichita, Texas, to water lands in the vicinity of Wichita Falls. Frank Kell, J. A. Kemp and T. R. Orth are backing the proposition. About twelve miles of ditch will be constructed.

Plans to irrigate 24,000 acres in the Rio Grande valley have been completed by the Texas-Louisiana Sugar Company of Texas, a recently organized concern. About \$200,000 will be expended on the irrigation system located between San Juan and McAllen.

J. S. Dennis, assistant to the second vice-president of the Canadian Pacific Railway, is planning the construction of a system of main and secondary canals for irrigation of 500,000 acres in Alberta. The company also plans the expansion and remodeling of its present system.

Directors of the United States Rice & Milling Company of Crowley, La., have arranged to extend the company's canals in Vermillion and Arcadia parishes for a distance of about twenty-five miles. Work will be begun at once. Storage increased by the construction work will water 10,000 acres.

The construction of the regulating works on Lake Tahoe in connection with the Truckee-Carson project, Nevada, has been suspended until spring on account of winter weather. During November contracts were let for 85,000 cubic yards of earth work on lateral district 5. In Carson Sink valley the weather continued favorable throughout the month.

Representatives of the various irrigation interests in the Pecos valley, Texas, are arranging for a conference during January for the purpose of forming an organization for co-operation in conversion, distribution and diversion of the waters available for irrigation. It is proposed to agitate the passage of laws relating to water rights and to revise the present laws now on the statute books.

Recently there has been formed the Arkansas Valley Irrigation Company of Colorado, with capitalization of \$400,000, for the purpose of reclaiming lands in Ford, Gray and Edwards counties, Kansas. The company will revive the Eureka irrigation ditch, commonly known as the Soule ditch. John T. Barnett of Denver, A. M.

\$8,760,000,000!! That's the Value of Farm Products for 1909—Isn't It Great?

Think of producing on the farms of the United States twice as much new wealth in one year as is represented by all the gold money in the world outside of this country!

No wonder our esteemed friend, Secretary James Wilson, of the Department of Agriculture, is jubilant.

It is a showing that every citizen is proud of, whether he had a hand in the production or not.

The most gratifying story told by these figures is that they represent a gain over the previous year of \$869,000,000.

We are going ahead—going ahead rapidly. That is the best message we gather from this report of our results for 1909.

But, instead of being content with these figures, let us take them only as an indication of what our real possibilities are, and let us use them merely as a mile post in our climb to better things.

Let each of us, for instance, look back over our operations of 1909 to determine whether or not we did our share toward making this showing possible.

We all know that there are about 6,000,000 farms in this country. Did 6,000,000 advance, improve, produce more wealth—or did one million, two million, or three million do all of this pushing and improving of methods to make a gain of \$869,000,000 possible?

We ought to stop and think of what has made the gains of former years possible. We must stop to realize that this gain of \$869,000,000 for 1909 is not due to so much more land under cultivation, but has been brought about primarily by better methods of cultivating the same land that has been cultivated before; by better methods of preparing the soil, sowing the grain and harvesting the crops.

Without the wonderful strides made in the development of farm machines, an \$8,760,000,000 crop would be entirely out of the question.

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How greatly to increase the value of the 1910 hay crop by using the right mower, tedder, baler, etc.;

How to know all about harvesting machines;

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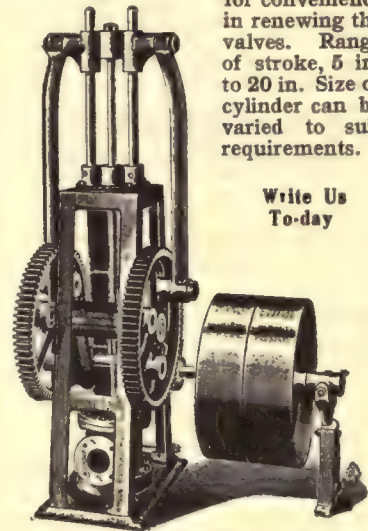


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Eppstein of Denver, T. A. Scates and Albert Watkins of Dodge City and J. W. Gilbert of Spearville are incorporators.

Under direction of the Department of the Interior there will be received until January 17th bids for the construction of an earth and gravel dam to be known as the Patillas Dam, and appurtenant structures near the town of Patillas, Porto Rico. The cost of this work is estimated at \$500,000. Bids for the construction of 6,000 feet of tunnel in connection with this project will be received later. Cost of the tunnel work is estimated at \$1,200,000.

Assistant State Engineer Ralph D. Goodrich has tendered his resignation to State Engineer Clarence T. Johnston of Wyoming, and will be succeeded by J. F. Kingston of Casper. Mr. Goodrich has accepted the position of chief engineer for the company which is constructing the vast Oregon Basin project in northern Wyoming. This project is the largest ever undertaken in the state, and will reclaim 300,000 acres of land with water from the Shoshone river.

It is reported that incorporation papers for the Truckee-California Irrigation Company will soon be filed in Nevada. Capitalization will be \$3,000,000, and O. B. Burgland of Gunnison will be president, with W. E. Tollestrup of Salt Lake City as secretary. Salt Lake Capital is said to be interested. By expending about \$500,000 near Reno the company expects to water land north of that city. A dam will be constructed on the Truckee river below Independence creek, and water will be carried for twenty-one miles through pipe and tunnel. The engineers estimate the cost of canals, tunnels, reservoirs and dams at \$500,000.

SIPHON ACROSS THE COLORADO.

The sum of \$150,000 has been authorized by the Reclamation Service to take up immediately the construction of a siphon across the Colorado river to supply water to lands in the vicinity of Yuma, Ariz.

This siphon is one of the important engineering features in connection with the Yuma project. It connects with the main canal on the California side at a point opposite and a short distance below Yuma, and will convey 1,390 cubic feet of water per second at a mean velocity of 9 feet per second under the river. Its total length is approximately 1,000 feet and its internal diameter 14 feet. It will be built of reinforced concrete, and will be laid in a tunnel passing through the bed rock under the stream.

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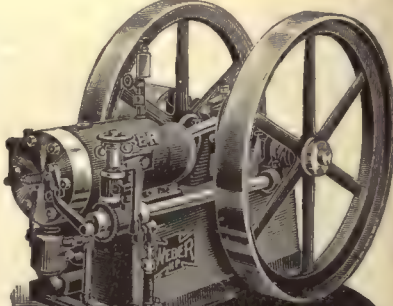
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NEW INCORPORATIONS.

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United States Real Estate & Irrigation Company; capital stock, \$100,000. C. H. Edgecomb, E. N. Nye, W. Bowman; Victor.

The Medano Land & Irrigation Company; capital stock, \$500,000; Joseph Warner, Myron H. Kinney, Earl M. Cranston; Denver.

The Royal Gorge Irrigation & Construction Company; capital stock, \$500,000; H. E. Lutz, R. R. Mitchell; Colorado Springs.

The Colorado Irrigation & Orchard Company; capital stock, \$1,000,000; Chas. N. Miller, Wm. E. Miller, Elmer Bisbee; Denver.

Idaho.

The Snake River Irrigation Company; capital stock, \$500,000; C. C. Crocker, W. A. Reed, D. W. Standard; Boise.

Maine.

The Kansas Irrigation Development Company; capital stock, \$2,500,000; Clarence Eaton, T. L. Croteau, Albert Jones, Clarence G. Trott, J. P. O'Donnell; Portland.

Oregon.

The Little Butte Irrigation Company; capital stock, \$1,400; E. S. Wolfer, L. K. Hawk, G. G. Guthrie, W. W. Taylor; Eagle Point.

Washington.

Okanogan Land & Irrigation Company; capital stock, \$45,000; Frank A. Morris, Geo. W. Longstaff, H. D. Wiard, Louis Dalhy, C. P. Bissett; Chelan.

New Jersey.

River Front Power & Irrigation Company; capital stock, \$50,000; Allen Benny, Harry Sylvester, Geo. Kramer; Bayonne.

Texas.

Rio Grande Valley Irrigation Company; capital stock, \$12,000; Winchester Cooley, J. E. Williams, I. G. McNary; El Paso.

Polvo Irrigation Company; capital stock, \$3,000; Francisco J. Alvarado, Mateo Carrasco, Z. Madrid; Presidio.

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A Humphryes' Hydraulic Ram will furnish you, when installed, with a permanent and automatic water supply. Why spend money on costly pumping plants and time, strength and expense in operating same, when a Hydraulic Ram will lift your water and deliver it with absolutely no expense. The Humphryes' Pneumatic System will supply your residence with water under pressure for all domestic purposes and give service heretofore obtainable only with an elevated tank or direct connection with municipal water works. Our New Catalog "Domestic Water Supplies" tells you all about the HYDRAULIC RAM and PNEUMATIC SYSTEM and will be mailed you upon request.

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GOOD IRRIGATION
~POWER~

Is the first step in preparing for bountiful crops. Don't depend on weather, wind or streams but use a

WITTE GASOLINE OR KEROSENE ENGINE



to raise water in any quantity. It makes you independent and saves paying out profits. Our plants sold under

FIVE YEAR BOND GUARANTEE

Special proposition to introduce in new localities. State size engine wanted or quantity and lift of water when writing.

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ASPINWALL
POTATO
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ABSOLUTELY THE BEST

Cutters Planters, Sprayers,
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Write for free Booklet, "Potato Culture"

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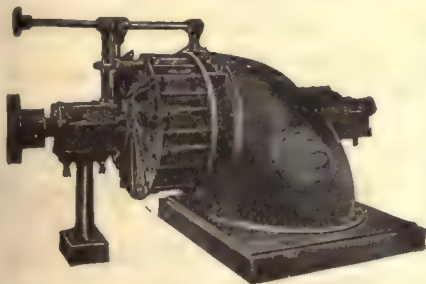
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SIX SHOTS IN FOUR SECONDS. Perfect hammerless non-clogging action. 24 to 32 in. GENUINE IMPORTED DAMASCUS BARREL. Full length top rib makes quick sighting automatic. Hinged breech block-solid steel wall always between shell and shooter. Easy take-down without tools. Bore, gauge and drop of stock optional. NO EXTRA CHARGE FOR ANY FEATURE NAMED. Don't buy until you have read our FREE BOOK describing this pump gun and our superb line of singles and doubles. ASK FOR IT TO-DAY. THE UNION FIRE ARMS CO. 324 Hubbardale, TOLEDO, O.

Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation



SAMSON TURBINE

When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

JAMES LEFFEL & CO., Springfield, Ohio, U. S. A.

Write Department K-2 for Catalog.

When writing to advertisers please mention The Irrigation Age.

Automobile Evidence

Automobile buying ought not to be a *gamble*.
Buyers ought to know *what* they are getting.
Not only how much power, how many speeds, and how much seating capacity but also

What they are getting in **service and satisfaction**.

Every maker ought to be able and eager to supply the necessary facts.

But most makers don't.

The trouble is they (the makers themselves) don't know.

Have never taken the trouble to find out.

So, they can't tell you how much mileage their cars are good for, or

How much you'll have to pay for repairs every 100 miles.

Yet these items are of vital interest to every car buyer.

Ask a maker **what** his car is good for and he'll tell you some news that makes good reading, but doesn't help you any. As for instance:

His car won a race. You are not intending to risk your life in races, so that **fact** doesn't mean much to you.

His car won an endurance contest. What, **one** endurance contest? You aren't buying a car for **one** endurance test; you want a car to endure for several years, to say the least.

His car won a hill-climb. You want a car to climb **every** hill you come to.

His buyers are satisfied.

So? "But how much does their satisfaction cost them?" you ask, and Mr. Maker can't supply the answer.

Probably he doesn't know.

If he does know, he doesn't tell.

We insist that every buyer ought to know **what** he gets.

He ought also to know **how much** he must pay for what he gets.

Purchase price isn't all the buyer pays.

Sometimes purchase price is only an initiation fee into an expensive surprise society.

Cheap cars usually **cost more** to keep to get.

But cheap cars are not alone in that.

Some fairly expensive ones are "dry docks" so often that the owner finds it almost a necessity to own two cars in order to get the regular service of one.

That's a fact known to the trade.

But it isn't advertised.

And those "satisfied owners" don't tell you it, because men seldom care to publish how they were "stung."

The automobile industry is now more than ten years old.

With ten years' experience, cars ought to be so well made as to run two, three, five years with practically no expense for upkeep.

But that wasn't possible until the invention and production of six-cylinder cars.

Because with a continuous power-streaming six-cylinder motor doesn't shake itself and go into the repair shop.

And no car has a continuous power-stream unless it has six cylinders.

Keep that fact in mind.

When Mr. Winton made his first Six-Cylinder car, he realized that thereafter owners would have less for upkeep.

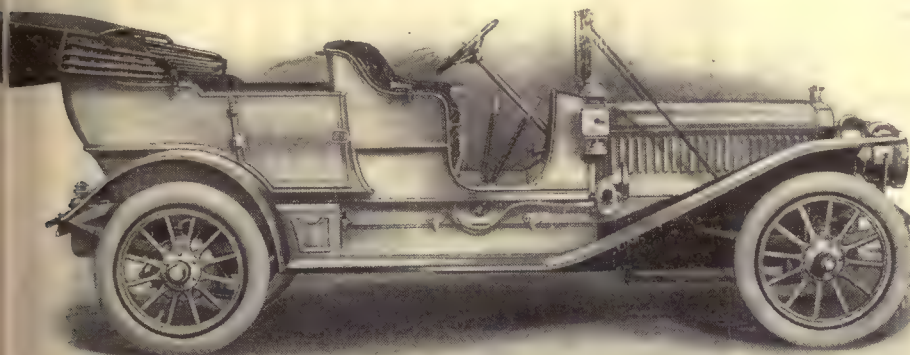
Because Sixes would stand up better than any other type ever made.

Then he set about to prove that fact.

For two years now Mr. Winton has been

THE WINTON MOTOR CARRIAGE CO.,
86 Berea Road, Cleveland, Ohio.
Please send Winton Six literature to

at Proves Something



WINTON SIX

Winton Six Features

Six cylinder, 48 horse-power motor. All working parts housed. Cylinders offset. Motor starts from seat without cranking. Bosch or Eisemann magneto, and storage battery ignition. Perfected Winton carburetor. Force-feed lubrication. Oil-bathed, multiple-disc clutch, running on ball-bearings. Four-speed, selective-type transmission, running on ball-bearings. Frame narrowed in front to permit short turns. Four large and efficient brakes. Channel-section, pressed steel front axle. Floating type rear axle. Semi-elliptical springs all around, with four shock absorbers and four rubber bumpers. 34 inch wheels. Tires—4 inch in front, 4½ inch rear. 22 gallon gasoline tank, with three gallons always in reserve for emergency use. Front floor and running boards covered with pressed sheet aluminum. 124 inch wheel base. Various color options. Price \$3000.

g from Winton Six owners sworn statements of upkeep.

ark you, sworn statements, not mere "I," or "I guess," but statements of fact, under oath.

These sworn statements prove that the Winton Six costs its owner practically nothing to maintain.

What does it cost to maintain a Winton Six?

Following figures are compiled from the sworn statements of the individual owners.)

In 1908 ten Winton Sixes ran 65,687 miles total upkeep expense of \$15.13.

In 1909 ten Winton Sixes ran 118,503 miles total upkeep expense of \$127.30.

us, in 1908 and 1909, twenty Winton Sixes ran 184,190 miles on total upkeep expense of \$142.43.

is distance is more than seven times the circumference of the earth.

is seventy times the distance of the 1909 Glidour.

is more than four hundred and fifty times the pace of the Vanderbilt cup race.

These twenty Winton Sixes were not handled by high-priced racing men nor factory experts, but by ordinarily intelligent boys, each chosen and hired by the individual car owner himself.

These twenty cars averaged 1315.6 miles travel per month—43.8 miles per day every day for seven months.

At an average cost for upkeep of 77 cents per one thousand (1,000) miles.

Incidentally, by way of illustration—one car (owned in New York) ran 25,290 miles. It cost nothing the first year. The second year the owner paid \$60 for overhauling.

Another car (owned in Chicago) ran 22,158 miles. It carried a Limousine body, and in two years cost not one cent for upkeep.

Thus these two cars (both running two years) traveled 47,448 miles on a total expense of \$60, averaging \$1.26 per one thousand (1,000) miles.

When the next salesman tries to sell you a car, ask him to show you his car's upkeep figures.

And remember this:

Low upkeep expense means not only that you are not burdened by repair bills.

It means also that you have a car able to stand up and go, and to keep going, day in and day out, every day.

Many car owners never enjoyed that experience.

Winton Six owners experience it right along.

And it is a vital reason why your next car ought to be a self-cranking, sweet-running, six cylinder Winton Six.

If you want maximum car-value at minimum cost, you'll get our literature.

It bristles with dollars-and-sense facts. Write today.

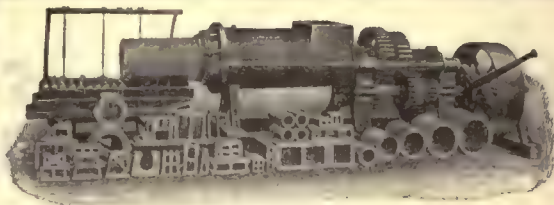
The Winton Motor Carriage Co.

Licensed under Selden Patent.

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plan to buy a car at less than \$3000, get quotations on our used cars. These are exceptional bargains. They represent higher value and better service than any new cheap car on the market.

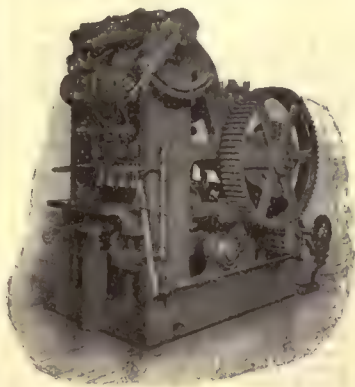
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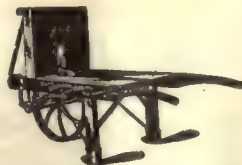
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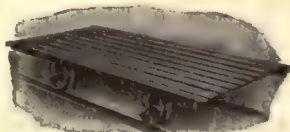
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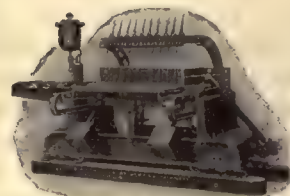
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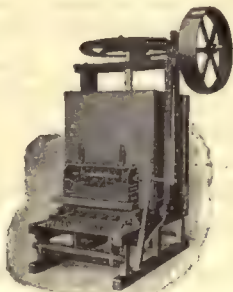
"BUILT RIGHT—
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We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

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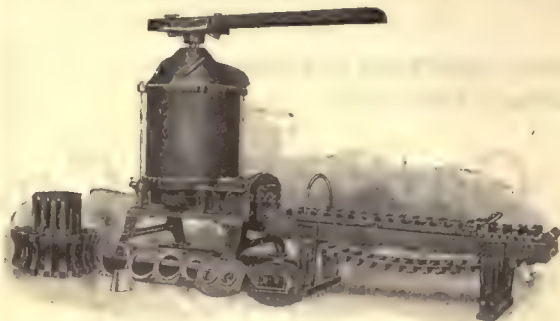
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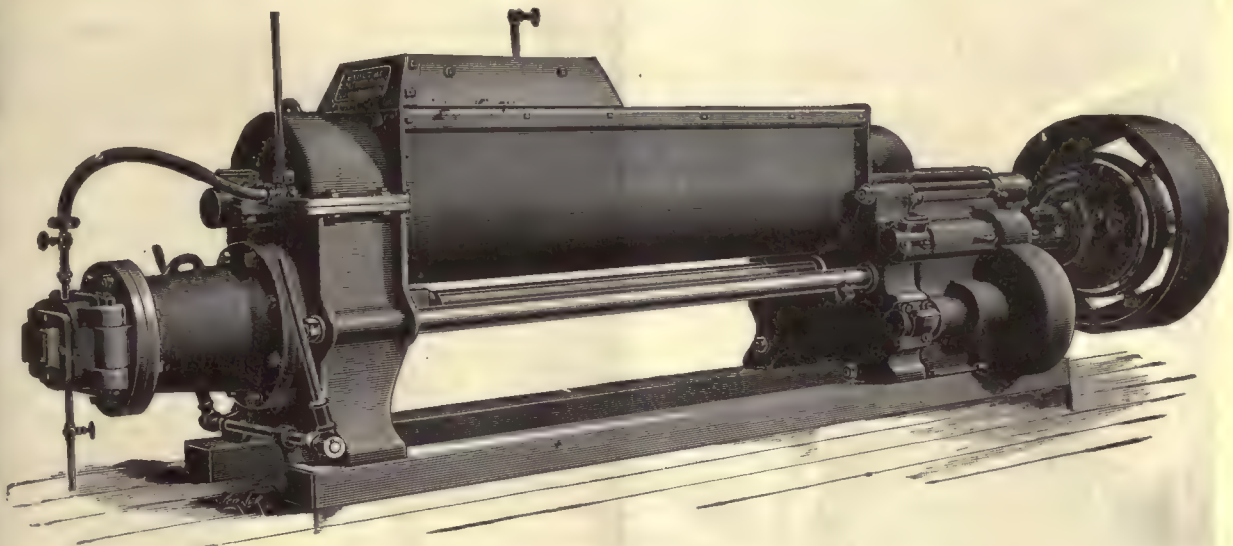


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A Ten Acre Farm

IN

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MEANS

A Comfortable Living

AND

Money in the Bank

IDAHO raised \$7,000,000 worth of fruit last year. Idaho's apples are in great demand in New York, Liverpool and London. A ten acre tract very often produces a yearly revenue of \$4,000.

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WASHINGTON produces wonderful crops of grain and fruit, and in this state the prices of good land range from \$10 to \$50 per acre. The report of the First National Bank of Dayton, Wash., shows lowest deposit for any one month in 1908 to be \$200,000, and the highest for any one month was \$543,000.

If you are interested in the Pacific Northwest, write us, and for information relative to rates, routes, stop-overs, etc., call on or address

E. L. LOMAX, G. P. A.
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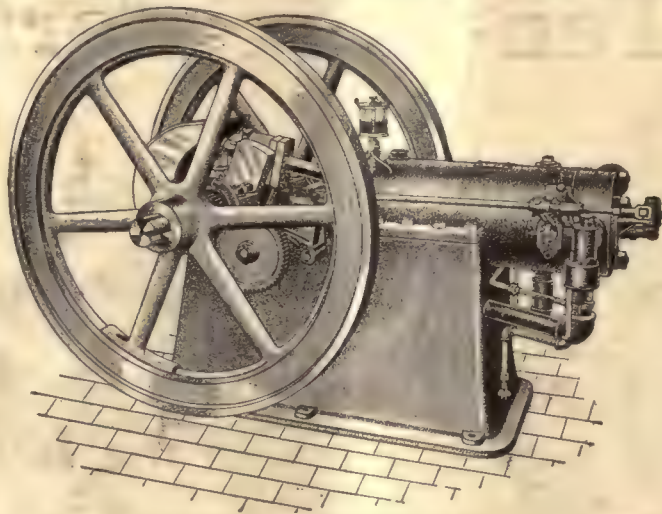
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High Class
**Gasoline
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Four Cycle
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Will Run
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Anywhere

Irrigating and Water Works Pumping Plants our Specialty

OUR LINE:

WIND MILLS
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ALL KINDS OF PUMPS
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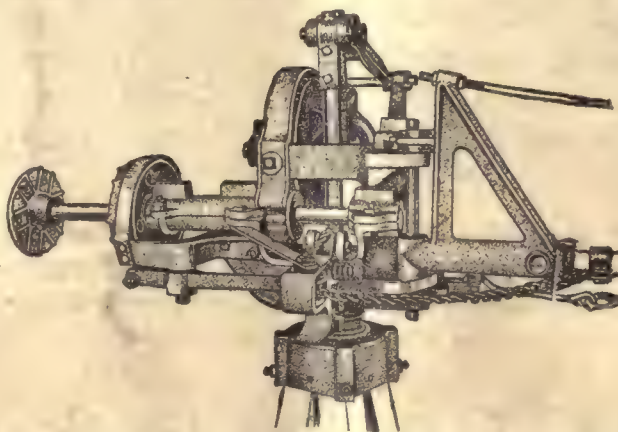
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Look
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**Windmill
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Ever Made



See that
**Extra
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on the
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THE IRRIGATION AGE

VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO. 4

CHICAGO, FEBRUARY, 1910

THE DITCHES THEMSELVES ARE THE BEST PROOFS



of the absolute success and superiority of digging by a method which produces, by carving to template from the solid soil, a channel with sloping sides and bottom smooth and true to grade. A ditch so dug stays dug, as we can prove by reference to the ditches themselves or by dozens of photographs of them. A ditch not so dug does not stay and is a constant expense for cleaning and redigging.

Some scores of land owners and contractors have found this so and are doing all their drainage and irrigation ditch work with an AUSTIN DRAINAGE EXCAVATOR.

WE SELL OUTRIGHT
OR LEASE

The Austin Drainage Excavator
The Austin Levee Builder
The Austin Drag Line Excavator

OUR FULL LINE COMPRISES:

The Austin Side Hill Ditcher
The Austin Highway Ditcher
The Austin Orange Peel Ditcher

The Austin Rolling Platform Traction
The Austin Tile Ditcher
The Austin Stump Puller and Grubber

Send for Catalogue "S"

F. C. AUSTIN DRAINAGE EXCAVATOR CO.,

Railway Exchange,
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N. E.—AGENTS WANTED IN UNOCCUPIED TERRITORY

Morris Machine Works

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Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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THE IRRIGATION AGE COMPANY, Publishers,
CHICAGO, ILLINOIS

The Temple Irrigation Equipments the most Economical and Certain Means of Lifting Water

55 YEARS' EXPERIENCE

Write us for Information and Prices—State Requirements



CENTRIFUGAL PUMP AND GASOLINE ENGINE IRRIGATION OUTFIT.

The Temple Water Elevators -- The Temple Centrifugal Pumps

Manufacturers of all kinds of Hand and Windmill Pumps

Also Manufacturers Single Cylinder, Double Cylinder and Four Cylinder Gasoline or Kerosene Engines

Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

THE TEMPLE PUMP CO.

Factory, 15th St. and 15th Place, near Canal St.
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Twenty acres will pay you more than the best 160-acre farm in Illinois or Iowa.

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OREGON FRUIT FARMS

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CHICAGO, ILLINOIS

Or UNION LAND LOAN AND TRUST COMPANY, Brogan, Malheur County, Oregon

A. T. AMES MANUFACTURING CO., Niles, Cal.

Manufacture

CUP LEATHERS

OF ALL SIZES

From

Oak Tanned California Leather

We Have Records of Five Years Continuous Service Without Renewing.



Pumping plant of the Sunnyside Irrigation Co., of Porterville, Cal., consisting of 2 No. 30 Ames Pumps driven by one Electric Motor. These 2 Pumps run day and night continuously and pump thirty-two thousand four hundred gallons per hour. 100 ft. to the surface from 12 in. Bored Wells, thence through 1900 ft. 10 in pipe, delivering the water 109 ft. vertical above pump; total vertical lift, 209 ft.

WRITE **A. T. AMES MANUFACTURING CO.,**
NILES, ALAMEDA CO., CALIFORNIA.

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Buy A 20th Century—Now

GRUB

\$1.25 TO \$1.50 an acre is all it costs to rid your land of sage brush with a 20th Century. Do it yourself—four acres daily. Only four horses needed. Cuts roots where weakest. (See cut at right). No need to plow after using our grubber. Sow seed at once. New catalog tells all about it. Send coupon now.

LEVEL

IT costs one-half the usual expense to level land with a 20th Century. You can reverse moldboard to left, to right, or set straight across—just as you choose. Cut off hummocks, fill hollows, carry dirt, spill it where you want it. Slope your land cheapest way. Clip coupon now and get catalog.

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SUPPLY ditches can be cut with a 20th Century. A. J. Nordloh, Byers, Colorado, made three miles of ditch and brought water to a desert claim. "Four horses and myself did it," says he. (See cut below.) You can cut a ditch 36 inches deep and 72 inches wide, and shallower. Ideal for surface drainage,

Cut Laterals

"V" SHAPED laterals carry water with least waste. 20th Century cuts them 12, 15, 18, 24 inches deep. Costs \$1.25 to \$1.50 a mile. One man can cut four to five miles a day. In moderately soft ground once up, once back is sufficient for an 18-inch ditch. Send for new catalog by filling in and mailing coupon.

Clean Laterals

HERE'S a Colorado man's experience with a 20th Century. "My laterals were so full of thistles and trash that they gathered under my plow beam and threw it out; but the 20th Century once up, once back, took the trash out and left the prettiest ditch you ever saw."

BUILD ROADS

THE 20th Century makes dirt roads at one-half the usual cost because it requires but one man and two teams. Catalogue explains all.

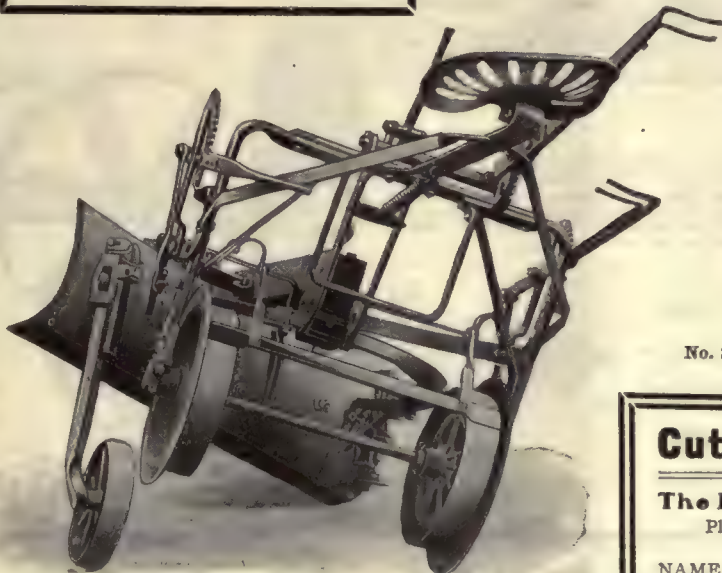
MR. IRRIGATION FARMER
REMEMBER—The

**20th Century
Grader**

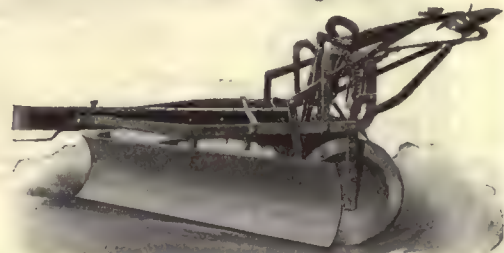
and one Man do All These
Things—and More



No. 1. 20th Century with sage brush attachment fastened to pole. Two keen, strong knives cut a swath 30 in. wide, 4 to 6 in. beneath the surface. Send for catalog.



No. 2. 20th Century tilted at ditching angle.



No. 3. 20th Century reversed to left. You can set it straight across for leveling.

Cut Off This Coupon—Mail It

The Baker Manufacturing Co., Chicago

Please send me that new Catalog.

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ADDRESS _____

TOWN _____

STATE _____

I own _____ Acres of Raw Land in _____

NUMBER

WHICH

WHERE

THE BAKER MFG. CO., 726 FISHER BLDG.
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Myers Power Pumps

Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches

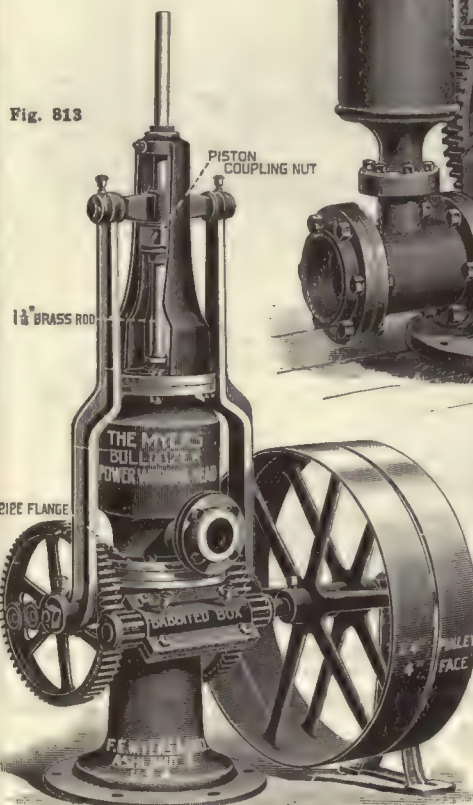
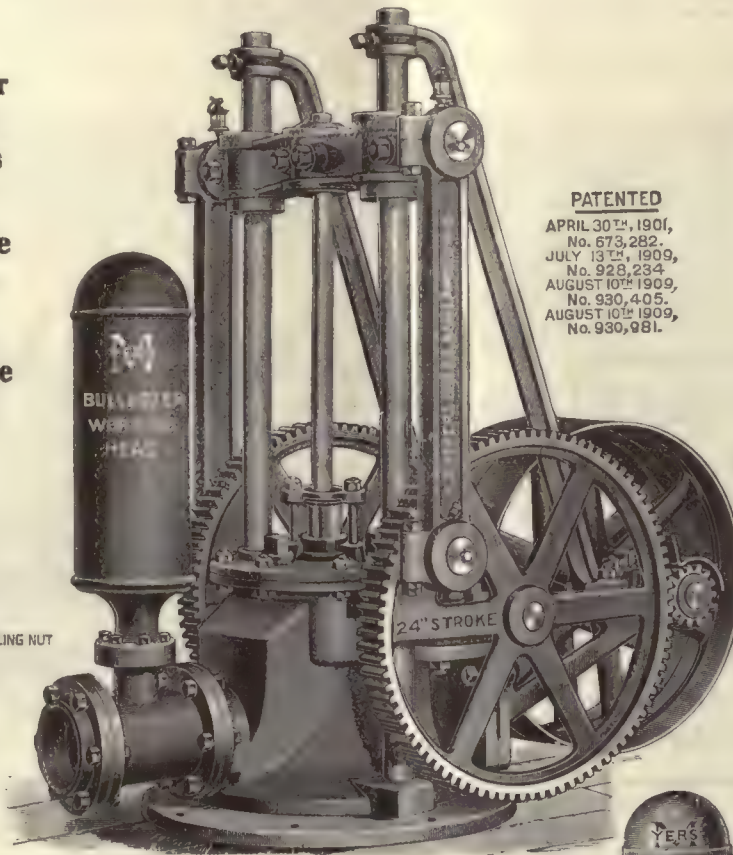


Fig. 813



PATENTED

APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,234.
AUGUST 10TH, 1909,
No. 930,405.
AUGUST 10TH, 1909,
No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2 1/2 to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

Write
for
Catalogue
and
Prices

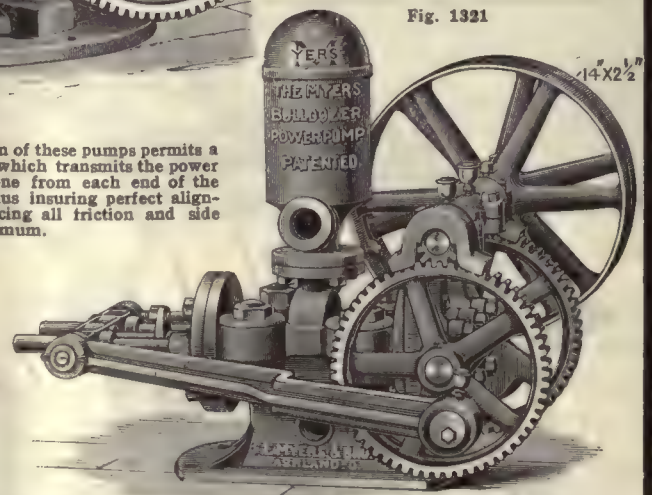


Fig. 1321

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Consolidated Wag. & Mach. Co.,	Salt Lake City.
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 Springfield, Ohio

GRAIN DRILLS

All the Grand Prizes and All the Gold Medals

given to pumps by the Alaska-Yukon-Pacific Exposition at Seattle last summer were awarded to

AMERICAN PUMPING MACHINERY

Few users of pumps realize that the efficiency of the centrifugal pump has been doubled during the last ten years and it is now the simplest, most dependable and most economical pump made.

The reason why "American" Centrifugals attain higher efficiencies than any other is, they have more refined flow-lines and there is the least possible resistance, caused by sudden change of direction and eddies of fluid when passing through the pump.

This feature enables the single stage "American" Centrifugal to attain mechanical efficiencies of 60 to 80 per cent. on total head up to 125 feet and make them the most economical pumps for irrigation purposes.

"American" Centrifugals are made in both horizontal and vertical styles, in any number of stages, in any size and equipped with any power.

Write for efficiency tests of "American" Centrifugals by one of the most eminent hydraulic engineers of the Pacific coast. Complete catalog free.



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THE WESTERN WORLD
 Now in Seventh Year

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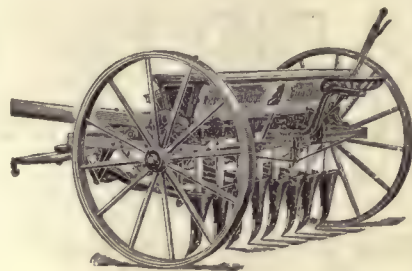
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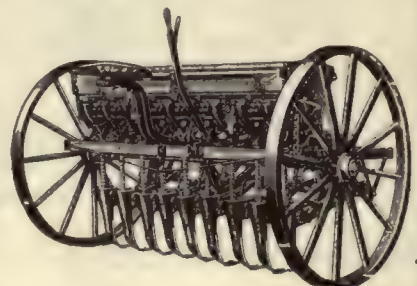
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No. 4

THE IRRIGATION AGE

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THE DRAINAGE JOURNAL
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D. H. ANDERSON, Editor

ANNOUNCEMENT.

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Contest Rights of Colorado Company.

Interesting developments are promised in the fight recently inaugurated by residents in the Big Laramie valley of Wyoming, against the Laramie-Poudre irrigation project in northern Colorado. With a question of state rights as a bone of contention and strong financial as well as official influence on each side of the state line, it is apparent that the fight will extend to the high courts and that neither contestant will be content until the final judgment.

Wyoming officials insist that the waters of the Laramie have been legally and properly appropriated in that state and that the storage reservoirs, projected by the Colorado company, will result in depreciation of the river's volume to such extent that there will be great financial loss to land owners in the lower Laramie districts. Notwithstanding these protestations and arguments, promoters of the Colorado project continue preparations for heavy construction work near the headwaters.

While the question of state rights under similar conditions to those obtaining in the Wyoming-Colorado controversy has already been submitted to the courts, yet it is believed that the Colorado irrigation company is prepared to submit a new line of defense and that it is confident of obtaining a favorable decision. Wyoming land owners have been aroused to the seriousness of the situation and with their usual vigor and energy have entered the fight to win.

Graves Heads Forestry Bureau.

By the appointment of H. S. Graves to the office of chief forester, President Taft has not only given conclusive proof of his zeal in support of the general policy of conservation, but he has also skillfully spiked the guns of the political clique that had planned to use the removal of the former forester in stirring up sentiment against the present administration.

Even the most ardent of conservationists must approve of Mr. Graves' appointment. If the former forester has builded policies that should endure, the present chief of the forestry bureau will insure their vigorous continuance. Trained in the same school, and holding similar views to those of his predecessor, Mr. Graves may be expected to pursue the work of this bureau with energy and with a keen appreciation of its value to future generations. It is predicted with every degree of confidence that there will be no apparent change in the general policy or the conduct of forestry conservation work.

But let us all devoutly hope that at least two evils—arrogance and politics—may be permanently separated from the forestry bureau. Let the new chief feel that he is but the servant of the people, intrusted with grave responsibilities and arduous duties. Let him realize that while he guards the welfare of the future millions of American people, yet he is not clothed with dictatorial power over the present generation.

Where theory conflicts with fact, it is not the fact, it is the theory that should be modified. In the rapid evolution of the west from desert to the garden spot of America, each year brings changing conditions. Ideals must give place to realities; fancies to facts. Policies of forestry preservation need direction from a mind so well balanced that it heeds today's progression while contemplating the needs of the morrow.

Unallied with any political party and owing allegiance only to his chief, who has already declared an unequivocal attitude in conservation policies, Mr. Graves enters the arena with the well wishes of all except the coterie of Third Term boomers.

Whom is to be the scapegoat when these ponderous investigations have run their course and congress is ready to assign a cause for the high cost of necessities and the resultant increased cost of living? Of course, there must be a "goat," otherwise the demonstration would fail to have its effect upon the public. Something must be done to appease the mental suffering of a million city-glued, salary-grabbing people who are incapable of solving the problem.

Trusts, labor and the tariff are all popular criminals in the eyes of certain classes. A decision that either, any two, or all, are responsible for the high price of food-stuffs would meet with ready belief, providing the charge is adorned with even a meagre covering of logic. And where the public's suspicions are already so firmly rooted, even the logic of the conclusion might be dispensed with without loss of effect.

But while the imaginary cause is, in the popular mind, reputed to be hiding behind barriers of capital, organization, or legislation, the virile words of James J. Hill, the master railroad builder of the northwest, recur to the mind and throw a new light upon this baffling economic problem.

For years he has preached a doctrine in which he found few supporters. Watching the wasteful methods of American farming, and noting the failure of production to keep pace with consumptive demand, he sounded the note of alarm—but only to unheeding ears. For was the country not prosperous? Were the people not living in affluence while they skimmed the earth of its food products?

In his public utterances Mr. Hill again and again, warned against that day when, without more intensive and more scientific methods of farming, production of food stuffs would fail to supply the demand. For the farmer he predicted an era of prosperity at the expense of the city consumer. Looking beyond even the present time he prophesied an evolution in methods of agriculture and the adoption of plans for conservation of plant foods within the soil. Only from this change in condi-

tions, he believes, the consumer may expect relief from the high living costs.

But while these observations may be of interest to those who are already studying agriculture or who are actively engaged in farming or gardening, there is still another condition that is of import. Unless there is immediate relief from the present high food costs city dwellers will be forced, both from necessity and inclination, to seek better fortune in the country. To maintain the balance of economic conditions, some consumers must become producers.

Observation at the recent land show and exposition in Chicago proves the fact that city dwellers are restless. During the entire period of exhibit there were probably fewer farmers in attendance than might be found at a county or township fair. Records of exhibitors show that it was citizens, not suburbanites, who made inquiry and asked to be supplied with detailed data.

Unless appearances are deceptive and signs of the times point to wrong conclusions, the western land owner may expect rapid appreciation in land values within the next few years. And the promoter of an irrigated project should find an increasing demand for his holdings.

Already the crowd of vultures has scented the prey and dozens of "dollar a month" and other similar offers are being placed before the city public. Doubtless there are some concerns engaged in this work that merit commendation, but it can be truthfully said that the majority are in the gold-brick class.

Basing his prediction upon experiments and investigations covering a period of nearly twenty years, Prof. L. E. Sayre, dean of the Department of Pharmacy in the Kansas University, predicts that the time is approaching when the loco weed, so common in many of the western and southwestern states, shall become an animal food of even more nutritious value than alfalfa. Newspaper reports intimate that he has already discovered a means to destroy the noxious elements within the weed, and that experiments are now being conducted to prove the practicable value of the method.

According to a lecture delivered before the Kansas Stock Breeders' Association, in session recently at Topeka, Professor Sayre asserted that a liberal sprinkling of the loco plant with sodium sulphate will result in the formation of an insoluble compound of barium, the only known poisonous element in the weed. When so treated, he declared, it not only becomes harmless to stock, but from its richness in proteids and nitrogenous elements it is a most desirable food.

In connection with his announcement of the discovery and his hope to demonstrate its value, Professor

Loco
Weed
Yields
to Science.

Sayre told of his long study in this special field and his inability to interest farmers or scientists until within the past few months. It is a recognized fact, especially in the districts that have been practically abandoned on account of the prevalence of this weed, that Professor Sayre merits high commendation for his perseverance and the successful issue to which he has brought his life-long study. With the loco weed turned from a poison to a food, thousands of acres may again be opened to agriculture and grazing.

Federal Bureaus Threaten Republic Alarmed at the growing tendency on the part of bureaus and departments at Washington, to seize and retain those rights and authorities which are, by the constitution of the United States, vested in the state governments, statesmen both in the national capitol and elsewhere are voicing a protest that promises to awaken the public to an understanding of the imminent evil.

Recent writings and utterances of that venerable senator, Gore, of Oklahoma, command the attention while the light of truth is thrown unerringly upon this menace to a free form of government. Pointing to all the pages of history and finding in each a confirmation of this declaration that bureaucracy is the door that leads to a monarchical form of government, he decries the tendency of the times and throws the gauntlet to those national officials who are active in support of the movement.

In a speech that has already grown famous for its caustic criticism of the bureaus for their steady encroachment upon state rights, the Honorable Frank W. Mondell, congressman from Wyoming, voiced sentiments that brought vigorous applause from his fellow members of the house. Speaking to the subject of the control of waters in non-navigable streams he severely arraigned the policy that had been advanced from certain quarters for the surrender by the state of its rights in connection with the prospective water power, and their assumption by the national government, for the purpose of allowing easements for specified periods.

At the conclusion of his argument against legislation that shall force states to yield their authority, in this respect, to the federal government, he said:

"It may be that some of the public land States have not provided for the complete control of the use of waters within their borders. It is possible that in none of them the laws are perfect. The fact remains, however, that nowhere, except in the people, to be exercised through state agencies, rests sovereignty and control over the nonnavigable waters of a State, and the people of these western States have not only realized that fact, but have clearly and definitely asserted that control by modifying, or entirely abrogating the rule of riparian rights, substituting therefor the law of appropriation, and setting up administrative machinery for the regulation and control of the use of water.

"This clamor for federal control over water and water power is but one phase of a general movement in the direction of filching away the reserved powers of the peo-

ple and lodging them in federal bureaus. Sugar coated with an appropriation, or the hope or promise of the expenditure of federal cash, it seduces some of the most ardent States' rights advocates. Advanced with the extraordinary argument that to take authority from the people locally and lodge it with a federal bureau is 'saving' something for 'all the people' and from the 'interests,' and backed by the demand of a certain section of the press, inspired by socialistic government bureaus, the propaganda has much influence with some legislators.

"I care not what others do or think touching these matters. For myself, I am still a believer in our dual form of government; still wedded to the belief that the people are better qualified to manage their own affairs than federal departments are to manage them for them. [Applause.] But whether I held these views or no, if I were as fearful of the ability of the people to govern themselves and attend to their own affairs as some seem to be, I hold no credentials authorizing me to aid and assist in a program which has for its purpose federal interference with the reserved rights and powers of the people who sent me here. I can not forget, and I shall not forget, that the people of my State have said in their organic act.

"The water of all natural streams * * * within the boundaries of the State are the property of the State—and that Congress has ratified that declaration.

"I should be false to my oath and recreant to my duty should I favor these policies which are in violation of that declaration." (Applause.)

Readers of this journal, who through actual contact or study, desire information as to the question of control of water power, will find much food for thought in this speech delivered by Mr. Mondell before the house of representatives last December.

Official Inquiry Lags in Interest

To those who had expected startling revelations and sensational testimony in connection with the congressional investigation into affairs of the department of the Interior, the preliminary reports of the proceedings are both insipid and uninteresting. Already public and press alike are inclined to avoid the subject or to give to it only a casual attention.

Testimony of L. R. Glavis to whose writings the sensational press had given free rein a few weeks ago and who was looked upon as the most damaging witness against the department, consisted largely in intimation and suspicion. Proof for this suspicion failed of development during his examination. His charges against the department for its conduct in the Cunningham coal land cases were based largely upon private conversations with individuals. His testimony on all subjects seemed circumstantial and the tangible statements were based only on his own conclusions.

The attitude of the department in regard to the inquiry seems best indicated by its failure to provide lawyers to question the witnesses or to in any way assist or impede the process of examination by the members of the inquisitorial body. Regardless of the attempt by the house of representatives to "play politics" in the appointment of the members of the investigating committee, neither the president nor the Secretary of the

Interior relied upon the services of an attorney to influence the trend of affairs while witnesses were upon the stand. This attitude upon the part of the government officials who had become involved in the controversy must be warmly commended. The defense seemed willing to allow the committee as wide latitude as it desired in seeking the truth.

Not until it became evident that the former chief forester, deprived of the political effect that he had expected in connection with his departure from office, would depend solely upon counsel to keep the inquiry within the desired bounds, did the defense decide to employ a lawyer to represent its interests.

Testimony thus far gathered by the committee is not of a nature to prove that the policy of the Interior Department in connection with the water power sites or the Cunningham coal land claims, is to be severely criticised. However, at the time of writing this review several witnesses of prominence are yet to be examined and it is possible, if not probable, that the "third term boomers" may yet make their political demonstration.

Protest Against Forestry Policies.

Among the first problems that may engross the attention of Chief Forester Graves is that embodied in resolutions recently passed by representative citizens of Flathead and Lincoln counties, Montana. From the nature of the protest against the withdrawal of lands for forestry conservation purposes on the recently opened Flathead Indian reservation in that state, it is apparent that local sentiment is decidedly hostile to the policy of the forestry bureau.

At a meeting in Kalispell on January 22 several hundreds of residents in these two counties passed the following resolution by unanimous approval:

"Be it resolved that it is the sense of this meeting that vast areas of land on the Flathead reservation have been classified as timber lands and as such withdrawn for settlement when in fact such lands are agricultural and not timbered in character.

"We hold that level lands of good soil having only 20,000 feet of saw timber to each forty acres should not be classified as timber land, and we insist that said lands be reclassified, and that all the lands that are agricultural in character without reference to the amount of standing timber thereon be opened to homestead entry."

Reports indicate that the meeting was not entirely harmonious inasmuch as many were in favor of more caustic criticism of the Forestry Bureau as well as the Reclamation Service for its withdrawal of large tracts of agricultural land at a time when there appears to be little possibility of early assumption of operations in pursuance of the engineering plans. Speakers of prominence declared that the plans as projected would ruin nearly as much land as that included in the tract to be irrigated.

OPENING OF YUMA LANDS.

At 9 a. m., March 1, 1910, the Secretary of the Interior will open to entry in the local land office at Los Angeles, California, 173 farms approximately of 40 acres each in the Yuma reclamation project, Arizona-California. The lands available for homestead entry in this unit are a part of the Yuma Indian reservation, and are located on the California side of the Colorado River near Yuma.

Under the terms of the public notice just issued, the charges which shall be made per acre of irrigable land are in three parts as follows:

(a) The value of the lands before reclamation, \$10 per acre for the total area in each entry, as required by Section 25 of said act of April 21, 1904, payable in not more than ten annual instalments, the first of which shall be \$1 per acre, and the remaining instalments at the rate of \$1 per acre per annum until fully paid.

(b) The building of the irrigation system \$55 per acre of irrigable land, payable in not more than ten annual instalments, the first of which shall be \$5.50 per acre and the remaining instalments at the rate of \$5.50 or some multiple thereof per acre. Full payment may be made at any time of any balance of the building charge remaining due after certification by the Commissioner of the General Land Office that full and satisfactory compliance has been shown with all the requirements of the law as to residence, cultivation and reclamation.

(c) For operation and maintenance for the irrigation season of 1910, and annually thereafter until further notice \$1 per acre of irrigable land, whether water is used thereon or not. As soon as the data are available, the operation and maintenance charge will be fixed in proportion to the amount of water used with a minimum charge per acre of irrigable land whether water is used there or not.

All entries must be accompanied by application for water right in due form, and by the first instalment of the charges for the Indian Lands and for building, operation and maintenance, not less than \$7.50 per acre for irrigable land, plus \$1 per acre for the non-irrigable land, if any, included within the entry. A second instalment will become due on December 1, 1910, and subsequent instalments on December 1 of each year thereafter until fully paid.

Transportation facilities in this valley are excellent. A branch line of the Southern Pacific Railroad extends through the reservation, connecting with the main line at Yuma. The principal markets will be southern California points and the mining camps on the Colorado River.

HEAVY PUMP TRADE.

On another page of this issue there appear cuts of pumps of the Gould Company, who, from their plant and offices in Chicago, have been receiving extensive orders for pumps to be used for irrigation throughout the west. There is a growing demand for the centrifugal pump owing to the steady increase in both underflow and quick pumping. Pump companies report extensive inquiries in advance for this season. This is because of the fact that in addition to pumping, which for years has been done from creeks and bodies of surface waters, the experiments of the Government at Garden City, followed by large private pumping projects in other parts of the west, have demonstrated that it is feasible to pump the underflow. This is particularly true where the water is not too far below the surface and in the districts where sandy loam or volcanic ash form the surface soil and where not too far down there is a sub-soil of clay close to bedrock.

Many a farmer who has thought that he had semi-arid land and has been using only the Campbell system of farming, now finds it possible to put down a centrifugal pump and irrigate at least a part of his land. Many large companies are now engaged in building pumping projects.

The cuts referred to show pumps made with a solid shell as opposed to the split shell type. Runners are of large diameter, adapting them for slow speed, and all parts accurately machined and fitted.

This company has already sold its product for irrigation work in Montana, Arkansas, Louisiana, Texas and other states. United States Government officials have placed orders with the company.

The vertical type of pump is the one most generally used for irrigation. Of the four irrigation systems followed in the west, the pumping system has received universal attention later than any other method, and the present year promises to show extensive development in this direction.

Notes on Practical Irrigation

D. H. Anderson

Semi-Arid and Arid Lands—Their Origin and Peculiarities.

From a general chemical point of view there is very little difference between the soils elsewhere on the surface of the globe, and those in the vast empire in the United States west of the 100th meridian. The soil possesses the identical organic elements already specified in the table given in the second chapter; the same organic substances abound; the processes of plant life are similar, and the same plant foods are essential to the welfare of crops. Still, there is a difference apparent to every man who thrusts a spade into the ground, plants a seed, and attempts to coax the soil to produce a harvest.

A bird's-eye view of the entire region impresses the observer with the appalling sense of a vast, barren desert, a few oases, here and there, where widely separated streams and springs exist, but in the main it is an illimitable ocean, a desolate plain, with occasional straggling clumps of scant coarse grass, sage brush, artemisia, chemical, greasewood, scrub oak, cactus and other sparse vegetation, kept alive by the scant snows of winter followed by dreary, hot, rainless summers, or by inadequate winter rains succeeded by a tropical dry season. This is the general aspect of the semi-arid lands.

Beyond them, except in the North, there is no winter, no seasons, nothing but a pitiless cloudless sky, tropical heat, unmitigated by moisture, with an atmosphere so dry and desiccating that animal matter exposed to its oxygen dries, or oxidizes and becomes reduced to an odorless powder, the toughest substance soon presenting the appearance of a moth-eaten garment. This is the aspect of the arid lands. Some say there are a hundred millions of acres of both kinds of land west of the 100th degree of longitude, others claim a hundred and fifty millions of acres, but the author suspects a still greater measurement.

Notwithstanding all these discouraging features, there is no land in the world that possesses greater fertility, greater capacity for plant growth, and that will so amply and so richly repay the labor of him who puts his hand to the plow and blinds his eyes to the hideous scenic features, until he has created an oasis of his own, in the midst of which he may sit in peace, plenty and content, beneath his own vine and fig tree, in a cooling breeze, sipping the pure cold water from his own olla hanging in the shade, while over, beyond him, sizzling in the hot sands of the so-called desert, eggs may poach in the intense heat, and not even an insect finds energy enough to emit a single buzz.

Reclaim the Desert.

By and by, a neighbor comes, sees the oasis and the near by sands, wonders if he can accomplish as much, tries it, and is surprised to find how easily it is done. Then comes another neighbor, and another, and still more, who push the desert farther off, until there is no desert as far as the eye can reach, nothing visible but rich harvests, fat kine, and plenty. The very atmosphere has changed; the rainfall is slightly increased, where rain and moisture had been strangers from a time far beyond the memory of man, the dews of heaven begin to fall and restore to the parched soil a portion of the moisture stolen from it by the greedy sun. It is a desert reclaimed, semi-arid and arid lands wrenched from the grasp of ages of barrenness and in the struggle forced to perspire plenty, comfort, and wealth. Is the picture overdrawn? The reader has but to look around to perceive the truth of it; it is a moving picture constantly before the eyes of him who turns them in the right direction.

There are men still living who remember when all that vast domain was considered as a desert, and indicated on the maps of long ago, as "The Great American Desert," even the Government regarding it as a desert not worth

offering the public, or so poor and worthless as not to be worthy of protecting against marauders.

It has been said that from a general chemical standpoint, there is no difference in the soil which offers so mournful and dreary a prospect as our semi-arid and arid lands, and that found anywhere else on the globe. In their physical characteristics, however, a vast difference is presented to the eye, but that difference is not to the disadvantage of the desert, for when we come to investigate, even carelessly, we discover a greater richness of inorganic and organic matter than in any other region on the earth. For ages the land has been exposed to the lixiviating action of rain water, in greater or less quantities—for it must be taken as true that at some period in the misty past all these lands were exposed to the wash of rains—without losing their fertility. As year after year and age after age rolled away, greater or less vegetation grew to maturity, and, unharvested, returned back into the soil to further enrich it, and hence it became richer and richer, for it must be remembered, that the fertility of the ground is not diminished by plants growing therein; it is not until they are removed from the ground that the soil gradually loses its fertility. Neither was there any impairment by their utilization as pasture grounds for countless herds of wild and domesticated animals, for those, during ages of pasturage, returned to the soil the elements most suitable for plant life.

General Characteristics.

Inasmuch as this article is devoted to irrigation, it will be understood in all cases, that the lands and soils referred to in it belong to that class known as "arid," or "semi-arid," or, as they are commonly called, "desert lands," as contradistinguished from those soils which produce crops through the instrumentality of rain. This is often said to be raising crops by "natural means," but it by no means follows that growing crops by irrigation implies "unnatural" means, the latter method being equally as natural as the former, the forces of nature being equally at the command and disposal of the farmer. Nature works along lines laid down by general laws, and man makes a special application of them for his own uses and purposes. He drains the land when the rain fall is too abundant, and when it is insufficient, or fails altogether, he irrigates it. He follows the laws of nature in both cases, without altering, straining, or violating them, indeed, he could not if he would.

Comparing the entire vast area of arable desert lands of the great West with the lands within the rain belt, the soil relations between the various localities are substantially the same. There are good and there are bad lands, lands that are fertile and others that are sterile; here we find soils which will grow luxuriant crops, there we see soils that are not worth even an experiment.

To realize this properly the reader must divest his mind of the idea of immensity that amazes, and often disheartens him; this idea eliminated, the only thought that should dominate his mind, if he contemplates practical success, is, how to abolish the actual differences and arrive at practical uniformity in agricultural results. He thinks of the pioneers who went into the forests with their axes and laboriously felled trees and extracted stumps with infinite labor, to prepare a clearing, in the soil of which he might plant his sparse crops, and wait years before establishing any sort of home. Perhaps he remembers how a bog or marsh had to be drained, and the years it required to "sweeten" the soil before it could be utilized. He does not fully realize that in the desert his land is ready for his muscles, for his seed, and for his crop; he does not dream that he does not have to grow old before carving out a comfortable home as he had to do in the old days, back in what he is pleased to call "God's country," and that out in the desert he may have a home and plenty while still young enough to enjoy them.

The climate differences are too much in favor of the desert to desire alteration, but the diametrically opposite methods of controlling the soil are difficult to be appreciated, though they are never baffling. They are no greater than elsewhere, but they are opposed by preconceived opinions, perhaps, rooted prejudices, and are, therefore, apparently more serious. There are illimitable treeless regions, covered or patched with stunted vegetation, that receive little

or no moisture at all from the clouds, and a soil parched, even burned by the hot sun. Yet the scientists have discovered and classified 197 different species of plants that love the desert soil and flourish in it. Many of them suitable for animal food, all of them indicating some quality in or under the soil as plainly as if they were labeled.

Thus, greasewood, or "creosote bush," indicates less than 0.4 per cent of alkali in the soil; salt grass and foxtail mean that there is plenty of moisture at the surface of the ground and consequently, the presence of free ground water not far below the surface; shad scale indicates dry land with less than 0.4 per cent of salt; rabbit bush flourishes on sandy soil comparatively free from salts, and will seldom grow under any other conditions; sweet clover and foxtail indicate wet land and less than four per cent of salts, though sweet clover will grow in six per cent alkali soil and produce a fairly good crop for forage if harvested very early.

So it is with the color of the soil. Indications are ever present of the dominant characteristics of the ground. Red soils always indicate iron in the form of an oxide; black soils mean carbonate of soda, an alkali ruinous to vegetation; white soils or gray mean soda in sulphate salt form; also deleterious to plants when more than one or two per cent; gray or brown and black cracked or checked soil with vegetation, signifies adobe, while barren, dark or light colored soil so hard that dynamite is more suitable for its tillage than a plow, is "hardpan" the former indicating a soil retentive of moisture, the latter indicating that moisture is somewhere beneath.

Another peculiarity of desert land soils is the frequent occurrence in the soil when plowed or dug up, of innumerable small roots or rooty fibers. They are, indeed, vegetable remains, but through lack of moisture, they have not fermented into humus, though it may be said that they have practically "oxydized" without losing any of their nitrogenous elements. It is well for the desert soil where this organic matter exists, that these rooty fibers have not fermented, for the inorganic matter, the alkalies and other mineral and metallic salts would have speedily devoured the product and left nothing for plants to feed upon. The reader has already been informed that both organic and inorganic elements are essential to plant life, and that the inorganic elements—the substances given in the table in the second chapter and their combinations into salts, are largely in excess of the organic elements. The same principle holds good in the case of desert soils—it is not a theory but a practical fact—that organic matter added to the inorganic means life; their separation, death. Hence, it is clear, that the addition or presence of organic matter and nitrogen, added to the mass of inorganic substances in the soil, tempers the latter and lessens its natural tendency to do harm. In the case of an alkali soil, vegetable matter and nitrogenous substances lessen the deleterious effects of the alkali, although it may not reduce the percentage of the salts. Whence, also, the presence of masses of coarse or fine vegetable fibers in the soil is evidence of either the absence of an excess of alkali, or that it is under control and innocuous to vegetation. Perhaps the reader may see in this a way to get rid of the alkali in soils and render them fertile. If he does, he will not be far wrong in his idea, as we shall see presently.

Lack of Water.

There are two conditions which are the bane of all desert lands, whether arid or semi-arid: Lack of water and the presence, in excess, of alkalies. We shall devote space here to some general remarks on both conditions, leaving it to subsequent chapters to enter more into details. The chapters on "Alkali Soils," "The Relations of Water to the Soil," and that on "Cultivation," will give more particulars, though at this point it may be necessary to include matter which will be repeated elsewhere, or presented from a different viewpoint. This, however, should not be deprecated as a fault, but extolled as a benefit, for the subject is of so much vital importance that it can not be repeated too often, lest it be forgotten.

There must be a water table at some point below every soil, at a less or greater depth. This may be accepted as a fact without going into geology to prove it. Such subsoil water originates in a variety of sources, through percolations from above, underground streams coming from great distances, from springs that have their original sources in some nearby hill or mountain land, by seepage from rivers, brooks, or streams, from an irrigating ditch, or pond, and from the artificial surface application, or through sub-irrigation. Al-

though the action of the earth's gravity pulls or draws water downward as it does every other object heavier than the atmosphere, the constant natural tendency of the water beneath the surface is to rise to the surface and evaporate.

It is this rise of the water table to the surface that causes more alarm than any other process of nature in the arid and semi-arid regions, particularly in the arid regions where all water must be applied artificially. The reason is obvious. The subsoil water contains in solution whatever soluble salts it may come in contact with, and reaching the surface, evaporates, leaving behind a deposit of the salts as crystals. Constant deep cultivation also has a tendency to bring up the water table with alkaline solutions, for we have already seen that the subsoil contains in reserve as much mineral matter and salts as the surface soil. And this is so whether the land is in the arid regions or in the rain belt, the disadvantage of the desert land being that the proportion of organic matter is not high enough to maintain an equilibrium of plant food consumption. Still, this is not an incurable disadvantage, for when the labor and expense of draining, mixing, tempering, and reducing soils in the rain belt is compared with the trifling care and attention devoted to desert land soils to render them continuously fertile, the wonder is that they produce any crops at all, so slight is the effort to make them yield.

Water Tables.

It is not uncommon to fill the subsoil with water from irrigating ditches, by putting into it all the supply obtainable during the flood season, thus bringing the water table sufficiently near the surface to supply the crops by capillary action. This brings the ground water within three or four feet of the surface, which is well enough for alfalfa and gross feeding plants, but is bad for trees, vines, and more delicate plants. In arid regions where irrigation is the only means of bringing moisture to the soil the water table may be a hundred or more feet below the surface and cannot rise on account of impenetrable strata of rock or hardpan. But in that case the irrigation water creates a new water table, the excess of the irrigating water sinking down until it meets an impervious stratum of rock or hardpan, and there it accumulates, becomes stationary, dissolves out the earth salts and when the surface soil dries out or is deeply cultivated begins coming to the surface by capillary action, every subsequent additional saturation of the soil from the irrigating ditch increasing the area and zone of the artificial water table. When that happens, and it does happen in desert lands sooner than it takes to clear the ground of trees and stumps in the rain belt, drainage becomes of vital importance, second to irrigation itself.

In semi-arid regions, where there is some rain fall, though inadequate, the amount of rainfall, whatever it may be, has washed the alkali out of the surface soil down into the water table, and the surface soil is freer from the deleterious material, which in the arid soils even prevents the seeds from germinating and obtaining a foothold strong enough to resist it, for when a plant has outgrown its infancy, and developed its first true leaves, it will require a most extraordinary quantity of deleterious material to destroy it. It refuses to absorb what it does not need and does not require, and unless wholly overpowered by the solutions in the water that surrounds it, it will grow up to be something more or less perfect.

It is said that six or eight inches of rain will mature a crop in the semi-arid region with proper cultivation. It matters little whether it be wheat or barley if the grain be sown very thin to allow more room for stooling. Six inches will grow it to fodder and eight inches will cause it to head out fairly well. An instance has been called to the attention of the author, where ten inches produced two crops without irrigation.

A fair crop of potatoes was grown in and removed from the fibrous, red clayey soil in April. The land lay on a side hill, about in the center, the summit of which had been roughly plowed to gather as much rain as possible so as to utilize the seepage for the potatoes. Immediately after the removal of the potatoes the land was plowed deep, and moisture still showing, it was carefully cultivated. Corn, of the variety known as "white Mexican," was then dabbled in and left to its fate. From the time of its planting, until harvested, not a drop of water was put on the land by way of irrigation, and only about an inch of rain in "Scotch mists" fell

(Continued on page 181.)

THE CAREY ACT

HOW TO ACQUIRE TITLE TO PUBLIC LANDS
UNDER THE ACT.

A Comprehensive Survey of the Regulations in Force
in the Various States.

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(Member Executive Comm., 18th Nat'l Irrigation Cong.)

III.*

Classification and Appraisal of Lands—Leasing and Temporary Occupation of Lands.

Montana and South Dakota—The statutes provide that "the board shall cause to be classified all lands received under the Act," and shall "sell or lease any or all of the lands required by the state under the Act," the price and terms to be fixed by the board according to such classification, "provided the selling price be not less than 50 cents nor more than \$2.50 per acre." Specific mention is also made in the requirements for proposals for reclamation, where among other recitals the company is to state that "perpetual water rights will be sold or leased to settlers," etc. The statutes of both states provide, also, that "For the purpose of expediting the settlement of any lands the board may permit such lands to be improved, occupied, and cultivated, for limited periods; provided, however, that such occupancy shall not preclude any person desiring to settle, from doing so at any time."

State Applies to United States for Patent on Lands.

The federal statute provides that "when an ample supply of water is furnished . . . to reclaim a particular tract or tracts of such lands, then patent shall issue to such state without regard to settlement or cultivation."

"Before this will be done the state must furnish proof of such supply of water," and the practice in the past as to making application for U. S. patent has varied.

Idaho, Wyoming, Colorado and New Mexico—The statutes and regulations provide that, after the settler's final proof, application is to be made for patent for the land embraced in his entry, and that upon receipt of same the state will issue a patent to the settler, and these states (with the exception of Idaho) provide also as below, viz.:

Wyoming, Colorado, New Mexico (also Oregon and Montana) provide that when proof of reclamation of all or a considerable part, of a tract by the contractor is furnished, the board shall apply for patent for the lands without regards to settlement and cultivation. Montana establishes a minimum of 2,000 acres to be applied for. Idaho provides, instead, that "if any of the lands shall remain unentered for two years from date of completion of work, the state shall apply for a patent, and when issued shall, upon application, issue patent to the construction company, upon payment for the lands."

Upon inquiry of the states directly affected at present, it is ascertained that the practice, heretofore, in Idaho, Colorado and Utah has been to make application for U. S. patent only as final proofs are offered. In Wyoming the board applies for a patent "as soon as the canal is ready to deliver water for any or all portions of the segregated tract and frequently before any large portion of the land has been filed upon or reclaimed," the same practice prevailing in Oregon.

In Montana "U. S. patent comes to the state in a lump, including a large per cent, or, possibly, all of it."

Price of Land and Payments for Such.

Idaho, Wyoming, Colorado, Utah and New Mexico,

*In the third of his series of articles on the Carey Act, Mr. Bohm continues his explanation of the regulations as adopted by the various states, but which are of interest to prospective entrymen. Comprehensive in its scope, and relating to matters that are of vital importance, readers may find it profitable to refer to the second paper which appeared in the January issue of the Age, and to which the third article bears a close relation.

50 cents per acre, payable 25 cents per acre at time of filing, and twenty-five cents when final proof is offered.

Montana and South Dakota statutes provide for the appraisal of land (as previously referred to) and for the payment of 25 cents per acre at time of filing.

Oregon—The statutes adopted in 1909, section 13, provide that "each application shall be accompanied by a payment of not less than \$1.00 per acre, to be made by the contractor out of the applicant's first payment and to be returned if the application be not approved. In the contract between this state and the only company having lands open for entry it is provided that the company may charge \$2.50 per acre, for "waste land," i. e., non-irrigable land, and "\$40.00 for water rights for irrigable land."

Montana—The regulations of this state provide for a maximum price of \$1.00 per acre and "the payment in full at time of making application."

In neither Montana nor South Dakota is the payment of any balance at time of final proof referred to—in fact, South Dakota statutes make no provision for final proof—but the statutes of both states provide that "after the state has received a patent and purchaser has made full payment for the land, the state will execute a deed for it."

Water Right Becomes Appurtenant to Land.

In all states when patent issues from the United States to the states.

Forfeiture and Redemption of Entryman's Rights.

In all states (except Montana and South Dakota) by statutory provision as follows, viz.:

Failure to take up residence.

Failure to submit annual and final proof.

Failure to make payments for water rights as they become due.

Idaho, Wyoming and New Mexico—The statutes provide as follows, viz.:

Upon default of deferred payments the company may foreclose and sell land and water rights, according to the terms of the contract, by advertisement in a newspaper in the county for six weeks. Both are to be sold to the highest bidder at the county court house, or other place mentioned in the contract, by the sheriff. The "company" is prohibited from bidding in the property at a greater price than the amount due on said deferred payments and costs of sale.

Within nine months after foreclosure sale the original owner may apply to the purchaser to redeem the land, and the purchaser shall assign the certificate of sale to him upon payment of the amount of lien for which sold, together with costs and interest.

If the lien holder becomes the purchaser and the property is not redeemed by the original owner within nine months, any intending settler may apply to the purchaser within three months after the expiration of the aforesaid nine months to redeem the property and have the certificate of sale assigned to him, upon payment of the amount of the lien for which sold, with interest and costs, the sheriff making the proper entries for record in either case.

If the property is not purchased by the lien holder, the sheriff is to first pay the lien holder, out of the proceeds of the sale, the amount of the lien, together with all costs and interest, and then to pay any balance remaining to the person against whom the lien has been foreclosed, after deducting his fees.

Colorado—The statutes provide that after the original foreclosure sale "the sheriff shall execute a certificate of sale, as in case of a sale of an execution, subject in all respects to redemption as in such case."

Utah—The statutes provide that the "lien may be foreclosed according to contract as mortgages are foreclosed," and that they "may be redeemed within one year with interest at not to exceed twelve per cent."

Montana and South Dakota—The statutes provide the same as those of Idaho, except that the period for redemption is twelve months instead of nine, and the rate of interest is fixed at ten per cent, and provide, further, that the holder of a deed who may be required to transfer the property to an intending settler shall have the right to remove any crops growing on the land at the time.

Oregon—The statutes do not mention this subject, but the contract before mentioned provides that "in case any entryman shall fail to pay any installment of principal or interest for one year after it becomes due, then the contract shall become void and all payments made shall be forfeited to the company and the land shall be deemed vacant and subject to sale."

The statutes of Montana and South Dakota provide also for forfeiture of the entryman's rights in case of default in payment of any unpaid balance due upon the land for a period of one year after water is available.

New Mexico—Special provision is made for serving thirty days' notice upon a settler failing to take up residence, to make proof, or to make payment to the territory for lands, for the purpose of affording him a hearing, and provide for his eviction by the sheriff upon cancellation of the entry, if so ordered by the board.

Assignment of Entry.

Idaho, Colorado, Utah, Montana, Oregon and New Mexico—The statutes provide as follows: "Assignment of entry may be made but the assignee shall possess all the qualifications of an original entryman and shall file a certified copy of a proper deed of assignment of all the rights of the original entryman, together with evidence from the construction company of the transfer of all the interests in the canal," together with an affidavit as prescribed. It is to be borne in mind that the assignment of entries up to 160 acres debars the assignor from making any further entry under the Act.

Wyoming—Assignments of entry, as such, are not permitted, but the entryman is privileged to relinquish his entry to the state (forfeiting thereby his first payment of 25 cents per acre for the land, and to make a new filing of up to 160 acres should he so desire).

He may assign the credit for water charges already paid up to a subsequent entryman or he may arrange with the company for a refunding of payments already made.

Leave of Absence Before Final Proof.

Idaho, Wyoming, Montana.—"An entryman may obtain leave of absence upon application to the state board but must in all respects conform to the law requiring cultivation and reclamation." The maximum length of time for which leave of absence may be granted is six months.

Utah.—Absence is permitted, except during time notice of intention to make proof is being published.

Oregon.—"Since annual proofs are not required, there is no occasion for leave of absence."

Character of House to be Built.

Idaho.—No final proof shall be accepted where the entryman established residence in a tent or house covered with canvas.

Wyoming.—Requires "a house that is habitable regardless of its character where entryman shows his good faith by continuous residence. Final proof within a short time would require the erection of a substantial house as indicating the intention of the settler to make it his permanent home."

Montana.—No restrictions—simply a dwelling.

Oregon.—No particular character required—so long as settler's affidavit states "that he has built a house." If the alternative proof of 30 days' residence is made (rule 9-A—see "Annual and Final Proof") then a substantial house of at least four rooms is required.

Cultivation of Entry by an Employee or Tenant.

Idaho, Wyoming, Colorado, Utah, Montana, Oregon.—Actual cultivation by someone upon behalf of the entryman is permitted, provided that entryman, in person, conforms to the requirements as to settlement, residence and proofs.

Minimum Acreage Irrigable in a Legal Subdivision, to Bring It Within a "Carey Act" Segregation."

Idaho and Wyoming.—"At least five acres out of each forty acres must be susceptible to irrigation to permit Carey Act entries thereon." It is to be assumed that the same view of the situation will govern in the case of the other states.

Railroad Right of Way.

Idaho and Wyoming.—"Where railroad right of way has been granted prior to the settler's final proof, a rebate for the acreage involved is allowed against the water contract."

Utah.—"No rule but equity."

Montana.—No rebate allowed.

In no case is a rebate allowed against the cost of the land.

Co-operative Associations—Special Regulations in Assistance of.

Montana.—(Sec. 2266) and South Dakota (Sec. 12).

"Parties desiring state aid shall incorporate as a 'co-operative irrigation association' for the reclamation, by their own labor, of arid lands. Each member shall subscribe to one share of stock for each 40 acre tract filed upon.

"After incorporating the association may apply to the Carey Land Act Board for aid and it shall be the duty of the state engineer to investigate the project, and, if found feasible, prepare the maps and data required for reserving the land, and, subsequently, to furnish the engineering plans necessary, and to exercise general supervisory control.

"The board, upon the approval of the plans by the state engineer, shall cause the lands to be segregated. The association is required to pay the United States Land Office fees, and a fee to the State Land Board of \$0.25 per acre.

"When all, or any part, of the land has been reclaimed, the board shall apply for patent for such—all expenses being borne by the association.

"After water has been available for four seasons, the association shall, on or before November 1st of such fourth season, pay to the state, such additional amount, not exceeding \$1.00 per acre, as may have been agreed upon prior to the reservation of the land, whereupon the state shall issue deeds to each stockholder of the association, having settled upon the lands, for the amount of land subscribed for, or the state may issue deed at any time when the land is paid for—the maximum in any case being 160 acres to each settler."

State Lands Coming Under Carey Act Projects.

Idaho, Wyoming, Colorado, New Mexico.—Lands belonging to the state, coming under Carey Act projects, may be sold at auction to the highest bidder, when water is available, upon application from intending purchasers, such sales, however, being limited to a certain acreage each year. The price of water rights for state lands is \$10.00 per acre, less than for other adjoining lands.

Oregon.—"State lands under Carey Act projects are sold at same prices and terms as other state lands. Price of water for such lands is a matter of contract between state, company and settler."

Wyoming.—The statutes of 1909 authorize the land board to appropriate "surplus Carey Act fees" for the purchase of water rights or a proportionate interest in lands and irrigation systems, for state lands, which lands may be leased or sold.

Montana.—The statute of 1909 provides for "investigation by the state engineer, of plans for irrigating state lands."

Utah.—The general statutes provide for a so-called "Reservoir Land Grant Fund," the proceeds of which are to be used in storing water for state and other lands. The federal "Carey Act," (section 4) provides that "any surplus of money derived by any state from the sale of (public) lands in excess of the cost of their reclamation shall be held as a trust fund for, and be applied to, the reclamation of other desert lands, in such state."

Thus far the discussion has been of subjects which have been defined by publishing statutory or departmental regulations (with the exception of those bearing upon the water itself, and its delivery).

In the next paper I shall refer at length to the many interesting phases of the subject of water and water rights and to some other matters of interest to the settler which belong to the realm of state legislation generally, such as taxation, schools, roads, etc.

(Continued on page 183.)

Graves Appointed United States Forester

Recognized as an authority in all matters pertaining to the preservation and recreation of the forest, and with a record for success in his practical as well as his educational work in this direction, Henry S. Graves enters upon his duties as chief forester in the United States Forestry Bureau at Washington, with the good-will of his fellow laborers in this field, and with the support of all conservations, whether from the east or west, who realize the vast importance of this work and its value to coming generations.

When President Taft announced the appointment on January 12, he was the recipient of congratulations for his selection of a man who combined technical knowledge with practical experience. The fact that Mr. Graves holds similar views and will advocate the same policies as his predecessor leaves no grounds upon which his selection may be criticised.

Mr. Graves was born in Marietta, Ohio, in 1871, but while still a child his father moved to Andover, Mass. For many years his father, W. B. Graves, was a member of the faculty at Phillips Academy in Andover as Professor of Natural Sciences.

After studying at the schools in Andover, Mr. Graves entered Yale in 1892. Here he gained high rank in scholarship, but nevertheless found time for athletics and became quarterback on the university foot-ball team.

Following his graduation from this university, and upon suggestion from his friends, he took up the study of forestry as a life work.

Completing his school work at Harvard he was invited to participate in the initial application of scientific forestry to American conditions, then in progress at Biltmore, N. C., on the estate of Mr. Vanderbilt. This practical experience fitted the young man for his further studies under competent instructors in Europe. At the University of Munich, in Germany, he studied under Sir Dietrich Brandis, an old world authority in all matters relating to forestry growth and preservation.

Upon returning to the United States, the second American who had ever pursued forestry studies in Europe, Mr. Graves found his services to be in demand. For two years he was associated with others in consulting forest work at New York city. In July, 1908, he became first assistant in the forestry department, recently created by the government as a part of the Department of Agriculture. As a result of his explorations and investigations he produced two publications, "The Black Hill For-

est Reserve" and "Practical Forestry in the Adirondacks." Prior to that time he had assisted in the editing of a volume under the title "The White Pine."

Upon the organization of a forest school at Yale, Mr. Graves was urged to become its head. To this call he finally gave heed and his work since that time as director of the school has been eminently successful. It is largely to his efforts that the Yale school of forestry is now recognized as second to none in the United States.

Since 1900, the time of his acceptance of the work of instruction at Yale, Mr. Graves has found opportunity for wide study in the west and south as well as in the east and middle west. His advice and conclusions in forestry matters were eagerly sought after by workers in the national forestry bureau. His publications are of a high order of professional merit and include the following:

Forest Mensuration.

The Woodsman's Handbook.

The Black Hills.

Practical Forestry in the Adirondacks.

The Woodlot (joint author with R. T. Fisher).

The White Pine (joint author with Gifford Pinchot).

He is editor-in-chief of the proceedings of the Society of American Foresters, as well as a prominent member of this body. Among the scientific organizations with which he is connected are the following:

Member of former National Conservation Association.

President Connecticut Forestry Association.

Director in American Forestry Association.

Vice-President Society for the Protection of New Hampshire Forests.

Associate Editor For-

estry Quarterly.

Member Royal Arboricultural Society (England).

Member Societe Forestiere de Franche Comte et Belfort (France).

Member Oesterreichische Reichsforstverein (Germany).

Connecticut Academy of Sciences.

In the field of practical and scientific forestry Mr. Graves has gained a reputation for deep study and comprehensive knowledge of conditions that has already gained for him a reputation among old world foresters. A thorough student in all branches of the work and a keen thinker on economic problems, he is said to abhor the petty wranglings of politics and to be ready to devote his time and endeavor to the work outlined for his department.



H. S. GRAVES.

Story of the Oregon Fruit Farms Project

In 1908, D. M. Brogan "discovered" the Willow River Valley. He is a Westerner hailing from the State of Washington, where he owns fruit land in the Yakima and Wenatchee country.

Having seen what this land produced, he was desirous of getting a body of irrigated land which would be strictly fruit land and had spent a great deal of time investigating projects in Idaho, Washington and Oregon. He inspected the Willow River Valley and decided that it was the best of all the propositions that he had looked at.

The Willow River comes down from the Burnt River mountains where it has a water shed area of about 500 square miles, and runs down through the center of the valley.

Leonard Cole, now president of the United States National Bank of Vale, Oregon, a town at the lower end of the valley, had located his home ranch at the head of the valley in 1868, and established his cattle and horse business there, ranging his cattle in the surrounding hills and winter-feeding on alfalfa which he raised along the Willow river. He had prospered during these years and when Mr. Brogan came to the valley, he owned some 12 different ranches which were all improved and on which he raised alfalfa and grain for his winter-feeding. He therefore, owned practically the entire water of the river.

In about 1900 the Government had established a stream measurement station on his ranch at a bridge crossing the Willow River and for the next six or seven years, daily stream measurements were made showing that the Willow River had a flood flow as high as 100,000 acre feet per year.

The river flows through a long series of hills to the point where it breaks out into the valley about one mile above his ranch, and there are numerous natural reservoir sites along this course making the impounding of water a simple matter.

The Willow River Company purchased all of these old cattle ranches from Mr. Cole with the entire direct flow of the river and filed on three reservoir sites which have the capacity of impounding 90,000 acre feet of water. Construc-



Home of A. Tschirgi in April, 1909.

tion was begun early in 1909, on reservoir, No. 1 and later in the same year on reservoirs No. 2 and 3.

Around each of the home ranches was the regulation farm orchard where apples, peaches, plums, apricots and pears had been growing from twenty to thirty years. It was the condition of these trees and the fruit raised, coupled with the sworn statement from Mr. Cole and other old inhabitants of the valley that there had never been a frost in their thirty years of fruit raising sufficient to injure the trees, that was the deciding factor in the selection of this valley as an ideal fruit raising district. The trees were without a blemish, the trunks being clean and the fruit without a sign of any fruit pest, though there had never been a sprayer in the entire valley.

In order that he might make no mistake, Mr. Brogan, in the Fall of 1908 when the fruit was still on the trees,

induced four fruit raisers from Palisade to make a trip with him and give him their expert opinion of the trees. What they saw was so satisfactory that in February, 1909, twenty-two of these fruit growers returned to the valley and purchased 1,000 acres of this land and agreed to plant it immediately on the assurance of Mr. Brogan that the first reservoir, impounding about 7,000 acre feet of water, would be constructed in time for the season's irrigation. With this nucleus of practical fruit men, the project was launched under flying colors. Most of them sold their farm ranches and moved into the valley, commenced the construction of houses. Their money helped to increase deposits in the local banks over \$100,000.

The company on its part, has been very active. Reservoirs No. 1 and 2 are finished and the present Spring will see 40,000 acre feet impounded. Reservoir No. 3 will also be finished in time for the Spring flood flow.

One of the largest bond houses in Chicago has purchased securities to the extent of one million dollars for use if needed.

The Oregon Short Line has agreed to build a branch line from the town of Vale through the center of this



New Home of A. Tschirgi in August, 1909.

valley to the new town of Brogan, which has already been established. The grading for this road is completed and is now awaiting for the steel and ties.

A general commercial store has been built at Brogan, a new hotel is half completed and will be ready for the Spring business. This hotel will be strictly up-to-date with steam heat, hot and cold water and mahogany furniture.

A bank has been organized with \$50,000 capital paid up and will be located in the new hotel building.

The temporary houses that were built this Spring have all been supplanted by bungalows and residences thus showing the class of settlers that has come to the valley.

Oregon Fruit Farms.

In 1909 a party of Chicago capitalists became interested in the Willow River Valley. They first visited the district only as individual purchasers seeking good fruit farms, but the possibilities of the valley appealed to them so strongly that they arranged for the purchase of 8,000 acres of land and water from the Willow River Company and have opened an office in Chicago for the retailing of the land in small tracts.

To intending purchasers this valley has many strong points.

First. Water supply is ample. There is no question but that there is sufficient for many more acres than the company contemplates irrigating.

Second. The construction work is practically all completed.

Third. The character of the settlers is high class. Most of them are experienced fruit men from older districts. This means that the valley will benefit from their long experience in the fruit raising business. They under-

(Continued on page 182.)

Irrigation and Fruit Raising

By B. C. BUFFUM.

The fruit development of the West has only been fairly begun but enough has been accomplished to indicate something of the place to be occupied by irrigated fruits in the world's markets. We know something of the highly developed fruit industry of California and other western coast states, but our interest is more closely centered on the present attainment and the future possibilities of domestic and commercial fruit production in the Rocky Mountain region.

Last year, on the occasion of our first annual meeting, it was my privilege to bring before this society what I believed to be the more important factors affecting fruitfulness in the arid region. Tonight I invite your attention to a somewhat general discussion of the present fruit growing situation and to some suggestions regarding the known and unknown principles underlying our irrigated horticulture.

Western Fruits and the Market.

There is an important and valuable trait in human nature which makes us take patriotic pride in home associations and things. Even though some of it is born of prejudice, it is most fortunate that each one believes in his heart and conscience that the things he associated with while growing up were a little better than those experienced by anyone else and that the best cook in the world can not quite equal the pies that mother used to make. This well nigh universal trait of character is the one which brings stability and contentment. We cling to the old and are slow to accept anything new as equal or better either in a personal or a general way. We have as yet but small native population in the west and the majority of our people were raised "back east," or "down south." These good people continually tell me that the eastern fruit is far superior in quality to anything grown in the West. While not quite a native westerner, I practically grew up in the arid region. I therefore think the choke cherries that grew on my father's ranch, were the best choke cherries in the world and I hail with peculiar satisfaction any proofs of high quality of our western products. I remember being pleased to read a report of a great peach expert that the southwestern Colorado peach was the finest flavored peach in the world, comparing favorably with the peaches of Armenia which are considered the standard of highest quality. A few other instances may be mentioned. At Chicago Exposition in 1893, the Idaho prune gained the distinction of "finest in the world", and western fruits have made important winnings at other great expositions. Apples from an irrigated orchard in the Arkansas valley, took second prize at the Paris Exposition in 1900 and apples from the Clark's Fork, close to the Wyoming line, won honors last year in competition at the national apple show at Spokane.

The proof of a pudding is both in the eating and in the amount eaten and a popular demand for our fruit must indicate some elements of superior quality. I recently ran across a report of Professor Sears, the Pomologist of the Massachusetts Agricultural College which was published by the State Board of Agriculture this summer, that is another link in my chain of evidence of superiority of Western fruit.

Professor Sears says:

"Even the most casual observer must be impressed with the fact that eastern fruit has been almost entirely crowded out of the better class of our eastern markets. There are honorable exceptions, but these men have personally overcome the prejudice of consumers against eastern apples."

Professor Sears then enumerates seven causes for the supremacy of Western apples, as follows:

First: That the orchards of the west are young and just in bearing. Second, That the apple business

is a great industry with them—an exclusive industry. Third, That their orchards are on new land containing all the elements of fertility. Fourth, That they never neglect spraying, keeping their orchards practically clear of insects. Fifth, That they practice the best methods of packing and grading—the few blemished apples that they produce, being discarded and the apples so graded that all in the box are exactly alike. Seventh, That their climate gives a finer finish in appearance than in New England.

I beg you to note that three points out of the seven given are the natural causes which contribute to the success of Western fruit—young orchards, rich soils, and better climate. The remaining four points are attributed to the intelligence shown, in better management and correct business methods.

Now listen to the three great advantages claimed for the eastern orchardist. "First he can get much splendid fruit land at \$10 to \$50 per acre, whereas prices in the West are much higher." Second, (He says) "the quality of New England fruit is superior to that of the West in the opinion of all good judges." "Third, they are right at home with the best of markets, whereas the western grower must ship 3,000 miles."

It looks like a rather serious series of handicaps for the western apple—poorer quality, higher priced land, greater expense of production, and 3,000 miles to market—yet withal, "Eastern fruits have been almost entirely crowded out of the better markets." (Quotation verbatim).

I need not reach further into this report or continue the quarrel about quality, though I believe it possible to at least modify Professor Sears' statements in this regard. Without considering the reasons, therefore, the point I wish to bring out is that Western fruit does now and will continue to lead in the markets of the world.

Wyoming as a Fruit State.

My time and the subject of this paper do not permit me to enter into any lengthy discussion of what has been done or what may be done with commercial fruit growing in our own state. Enough has been accomplished to demonstrate that there is no corner or altitude in Wyoming, where grain, potatoes and hay will grow that can not be made to produce a domestic supply of apples, cherries, plums and small fruits of various kinds. In my own mind, profitable commercial fruit production in favorable localities is only a question of a little time and development. I am assured that in Big Horn County alone, during the next five years, there will probably be an average of as much as one thousand acres of commercial orchards planted each year. To those who would make a business of raising tree fruits for market, I would give a word or two of advice:

- Protect with wind breaks.
- Plant on alfalfa land that is in good tilth.
- Plant ten or more acres.
- Choose known hardy commercial kinds for main planting.
- Practice clean culture and constant culture.
- Watch for diseases and insect pests—We have almost none at present.
- Wrap young trees in winter.
- Prune systematically.
- Thin when the fruit sets too thickly.
- Irrigate thoughtfully.

I wish to discuss as briefly and as practically as possible, the irrigation of fruits. There is altogether too little accurate information to be had, in fact too little knowledge of the irrigation of fruits and it can be gained only through more study of the underlying principles of irrigation fruit raising.

The Wyoming Horticulture Society should make itself felt in a demand for more investigation—not of methods of building ditches and bringing water to the land or the mechanics of applying water to orchards and small fruit plantations, but investigations which will throw more light, on when and how to supply water to the plant and the reasons therefor. We know how to plant trees and how to apply water enough to drown the life out of them. A few ranchmen have planted trees and raised good crops of fruit without clean culture or any other kind of culture. There has been over irrigation and

President's address, third annual meeting of the Wyoming State Horticultural Society, Douglas, Wyoming.

under irrigation and the very lack of care has given us great faith in what may be done by correct methods.

The interest of our people has been in cows, not trees; in sheep rather than in shade. With development, we are losing interest in the range to a large extent and centering it in the home. Now we need to know more of the indulging principles that will guide us in our practice under our varying conditions. Because one man gets apples with a single irrigation and another gets a crop by applying eight irrigations is no reason for a third using either one or eight applications of water. Why do we apply water anyway and what does more or less of it do to the growing or to the dormant plant? It is not unreasonable to ask that the state and the general government put forth more effort to solve these questions.

Irrigation and Plant Food.

We seldom think, perhaps, of the relation of the food supply to the life of the plant as we do in rearing animals. The statement has been often made by live stock breeders that the "corn crib is the best mother," and all successful animal feeders understand the importance of a balanced ration. A rich and nutritious soil solution containing the right proportion of the different plant foods is of as much importance to the individual plant and to the collective crop as is the full corn crib and balanced ration to the growing calf and the increasing herd.

By limiting the food supply the Japanese have dwarfed giant kinds of trees. We dwarf apple and pear trees by using small or slow growing stocks to limit the supply of food to the scion. Some animals are constitutionally good feeders and in like manner there are inherent feeding qualities in plant varieties. It is well known that rye or buckwheat will gather food from poorer soils than other grains. One of the more important economic achievements of Burbank, is in the great growing force or power which he secures in his productions. To secure a maximum growth, there must be an abundant and available food supply in the soil. We also vary the balance of the ration to secure large vegetative growth or a larger production of seeds and fruit.

Many of the life processes of animals are reversed in plants. Higher animals take food through their heads, higher plants through their feet. The animal takes solid food which must be organic, the plant never uses anything but liquid or gaseous food which is usually simple and inorganic. Animals digest their food on the inside and burn it to produce heat, the plant digests its food on the outside by the influence of light on the leaves and reverses the burning process. The animal needs a practically continuous supply, whereas the plant feeds in seasons with long dormant periods of rest. The food of animals is in sight, tangible and known, and the food of plants is in the soil, out of sight, intangible and unknown save through the mind's eye of the observer who notes its effect on growth or to the chemist.

These are all simple statements and known to everyone, so it might seem like a loss of time to reiterate them, but you will agree with me that we know too little of the basic principles underlying our practice and we may make use continually of all this kind of knowledge we can obtain.

The plant then takes its food and drink together. Most plants can not even absorb water through their parts above ground—they obtain it with the soil solution and the strength of this solution varies with every factor which influences the character of the soil and its moisture content. It is pretty well settled in my own mind that the strength of the soil solution is the main factor which determines the amount of water used by a plant in its growth and maturity, though this relationship has never been studied. Those who have investigated the amount of water used by the plant in its growth, have ignored the character and amount of plant food which might be carried with it. The plant physiologist has believed in selective absorption, but where the chemist and physicist has investigated, it appears that absorption is purely mechanical, i. e., it is osmotic. If a poison gets into the soil, the plant absorbs it and commits involuntary suicide as shown in Colorado, where Dr. Headden discovered that arsenic used in spraying has killed many trees. In our investigations of alkali, Professor E. E.

Slosson and myself found that the amounts of salt solution absorbed by plants were inversely proportional to the strength (measured in osmotic pressure) of the salts in the solution. This being true, the strength of the solution must directly affect the feeding and nutrition of plants. One investigator found that it took 912 pounds of water transpired by the plant to produce one pound of growth. Another investigator found that 225 pounds were used. It would be interesting to know and especially by us here in the West, where we manage the water supply of the soil through irrigation or conservation, whether the thickness of the soup used by the plant does not determine the amount of it needed to satisfy vegetable hunger. If this is true, less water is needed in the arid region to produce growth than will be required where rainfall has leached out a portion of the soil salts.

It is through the control and management of the food supply that we can exert such perfect control over our orchards in the west by our use of irrigation and keeping the underlying principle in mind, will help us in practice. Our soils are lastingly rich in the mineral plant foods which are so important in the formation of wood, fruit and seed. If there is too much soluble salt in the soil, we may add some amendment that will make it less soluble as does the California orchardist when he adds gypsum to correct the effect of "black alkali," or we may add drainage and cultivation so too much of the salt will not stand in solution or we may wash out the surplus salts by using abundance of water. Generally on our good soils we need only to apply water when we would have the trees make growth or withhold it when we want them to mature or become dormant. If the soil should remain too wet, we may use a quickly growing cover crop to pump out the surplus moisture. I have no doubt that the lack of clean culture in some of our orchards has been a blessing in disguise to automatically overcome the deleterious effect of too much irrigation. We undoubtedly make many mistakes in the time and amount of irrigation and it will take much experience and study to overcome them.

Irrigation and Orchard Control.

Erasmus Darwin, the early agricultural poet and grandfather of Charles Darwin, pointed out that the bud is the individual in plant life. It is the development, maturity and welfare of the bud that is of most concern to the orchardist. If the buds ripen and put on enough overcoats to protect them through our long winters, there is little danger that loss will be incurred by cold and storm. Correct management of the irrigation of our trees secures maturity of the buds and ripening of the season's growth of wood.

Too much irrigation during the latter part of summer and early fall is undoubtedly a frequent cause of winter killing of trees. After the season is so far advanced that new growth will not be produced, the orchard soil should be filled with water to prevent injury from winter drouth.

Another important factor in frost control is the possibility of preventing injury to the fruit buds in spring by keeping the orchard wet during the danger period. Enough latent heat is given out by the standing water to prevent killing the blossoms except in very severe frosts.

All too often the man with a small home orchard and plenty of water to use substitutes irrigation for cultivation. The arguments for clean culture are too numerous and weighty, however, to permit of any other practice. Of course this does not interfere with the growing of short period cover crops of legumes to gather nitrogen and add humus to our orchard soils.

Until such time as we shall breed more stability and fixity into our fruits to produce adapted varieties which will be at home in our western environment, the fruit raiser under irrigation must expect considerable variation in his product. Fortunately the result of our rich soils and the stimulation given plants by the artificial application of water is increase in productiveness, size and other qualities and with skilful treatment and the application of plant breeding methods we have great opportunities to improve varieties for our own conditions. With our soils, climate and irrigation, the mountain region of the west by force of favorable natural conditions will lead in the production of more important farm crops and fruits.

Irrigation of Alfalfa

By SAMUEL FORTIER,

Chief of Irrigation Investigations, Office of Experiment Stations,
U. S. Department of Agriculture.

Experience in the growing of alfalfa for more than two thousand years shows that it thrives best in the soil and climate of arid and semi-arid regions. The abundant sunshine, the warmth, and the deep, rich soil prevailing throughout the western half of the United States seem to be well suited to its requirements, and over half a century's experience has shown that there is comparatively little cultivable land in the West on which it can not be grown. One finds the same varieties flourishing in Imperial Valley, California, 100 feet below sea level, and maintaining a sturdy growth on the San Luis plains of Colorado, 7,500 feet higher. Alfalfa makes a remarkable growth in the warm sunshine of Arizona, yet it is rarely injured by cold in Montana.

One can not well overestimate the importance of alfalfa to western farmers. The alfalfa field and the alfalfa stack provide the best means of protecting stock against enormous losses by starvation when the excellent pasturage available throughout the greater part of the year fails either through drought in midsummer or by being covered with deep snow in midwinter. A single ton of alfalfa may save the lives of many head of stock by providing feed during short periods of cold, stormy weather. Alfalfa can not be excelled as a preparatory crop on soils that have long been unproductive. Likewise, it maintains the fertility of soils naturally rich in plant food, and if used as a base of rotation makes possible abundant crop yields of various kinds. In 1906 the chemist of the Colorado Experiment Station* estimated the fertilizing value of the stubble and roots of mature plants at \$35 per acre when measured by the commercial value of artificial fertilizers on the market. Moreover, the yields are exceptionally high when irrigation, favorable climatic conditions, and proper treatment are combined. Seven tons of cured hay at three cuttings are obtained from the best fields of Montana, while frequently 9 tons in five cuttings are harvested in California. This large tonnage, together with its high feeding value and the fact that it is consumed by practically all farm animals, makes it not only a convenient and useful crop to the grower, but a highly profitable one as well.

Notwithstanding its present importance and great value in irrigation farming, the profits on the area now in alfalfa can be greatly increased if more care and skill are exercised in growing it. The western irrigator has seldom been able, financially, to dig his ditches and prepare his fields in such a way as to insure the most efficient irrigation and the highest profits. In consequence, valuable water is wastefully applied to land that is in no fit condition to be irrigated. On the large acreage in irrigated alfalfa this amounts to an enormous loss. This fact, considered in connection with the importance of this crop, the rapidly increasing area devoted to its growth, and the large number of farmers who are settling in the West and who will be for years dependent in a large measure on alfalfa for a livelihood, would seem to warrant the collection and publication of any information designed to improve the present practice.

As its title implies, this publication deals with but one feature, that of irrigation, and its scope is necessarily limited to irrigated lands. There has been no attempt to present or discuss at any length other phases of the general subject of alfalfa growing,† and wherever mention has been made of these it has been only to show their relationship to irrigation.

In the examination of alfalfa fields and the collection of the data necessary for this publication, advantage was taken of the organization of the irrigation investigations of this office, which is well adapted for such a purpose.

Through the state and territorial agencies of that division and through co-operation with the members of state experiment station and the state engineers it was possible to obtain with a high degree of accuracy the conditions and irrigation practice with reference to this crop throughout the entire arid region.

Irrigable Lands Adapted to Alfalfa.

Perhaps the most essential conditions for the production of alfalfa are abundant sunshine, a high summer temperature, sufficient moisture, and a rich, deep, well-drained soil. All of these essentials, save moisture, exist naturally in the arid region of the United States, and when water is supplied it makes the conditions ideal. Although alfalfa can be successfully grown under a wide range of soil conditions, yet all western lands are not equally well adapted to its growth. For this reason those who are seeking such lands with a view to their purchase should first make a careful examination of the character and depth of the soil, its behavior when irrigated, the slope and evenness of the surface, the presence of injurious salts, and the facilities for drainage.

One of the best indications of the character of the soil is the native vegetation. When sagebrush, buffalo grass or cactus is found on a tract it is reasonably certain that the soil is fertile, easily tilled, and well drained. On the other hand, the presence of greasewood, saltwort, salt weeds, or similar plants is indicative of a heavier soil, less easily cultivated and irrigated, and containing more or less of the injurious salts usually grouped under the common name of alkali.

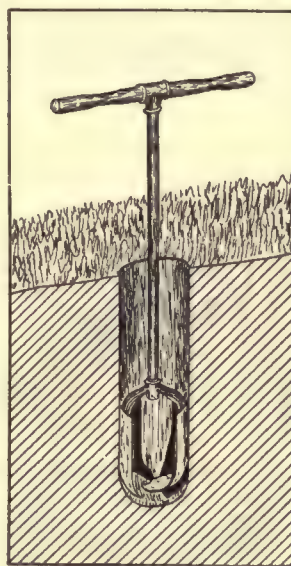


Figure 1.—Soil Auger.

In arid regions most cultivated plants are deep rooted. They draw their supply of plant food and moisture from considerable depths, and the deeper the soil the larger is the feeding ground for the roots and the greater is the capacity to store water. The presence of any impervious stratum lying between the first and fifth foot prevents deep rooting and the storage of moisture. A hard stratum lying between the fifth and tenth foot is likewise injurious, but to a less extent. The character of the subsoil may be readily determined by boring holes, with a suitable soil auger similar to that shown in figure 1, to a depth of 10 feet, if necessary, and taking samples of soil at different depths. It will be possible usually to find under irrigation in near-by fields soils similar to those being examined, but if this is not possible a trial may be made on a small scale to determine how the soil acts under irrigation. In general, sandy loams irrigate well; clay is hard to cultivate when wet, does not absorb water readily, and bakes and cracks when drying; while a soil which is too sandy will not retain sufficient moisture to maintain crops.

The most favorable condition for irrigating is a smooth surface, with a uniform slope of 10 to 20 feet to

*Colorado Station Bulletin 110.

†These are treated in U. S. Dept. Agr., Farmers' Bul. 339.

the mile. Such land costs little to put into shape for the spreading of water over it, and the slope insures good drainage. Sometimes the land is cut up by ravines which increase the labor and cost of putting water upon it, or it may have too much or too little slope. In other cases it is full of buffalo or hog wallows, which are difficult to bring to an even grade. If land which is naturally smooth on the surface and of the right slope costs \$5 per acre to prepare for irrigating, hog-wallow land may cost \$15. Besides, some hog-wallow land is inferior in quality, frequently being charged with injurious salts.

Lastly, good drainage is essential for a permanently productive irrigated farm. It is practically impossible to supply crops with sufficient water for the best growth without applying so much that some will seep into the subsoil. Unless this can flow away the level of the ground water will rise until it comes near the surface and drowns out crops, and perhaps cause an accumulation of alkali. If the natural drainage is not good it must be supplied artificially, but this need not be done until a few crops have been raised, for the reason that it is not possible to tell until after irrigation where the drains should be placed to drain the land most effectively.

The frequent failures to get a good stand of alfalfa in the humid portions of the United States have led some writers on this subject to prescribe within somewhat narrow limits where and under what conditions this forage plant can be grown successfully. That this view is not correct as regards the irrigated portion of the United States is amply shown by the fact that it is grown successfully in every state and territory of the arid region, in localities which are not only widely separated but possess many radical differences in the way of rainfall, temperature, altitude, topography and soil.

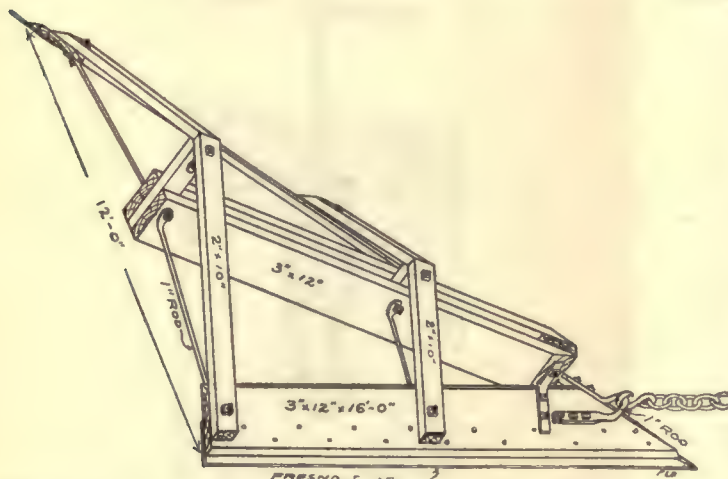


Figure 2.—Sagebrush Grubber Used in Clearing Land Near Riverton, Wyoming.

The Removal of Native Vegetation.

In arid America few places are so barren as not to produce plants of some kind, and the first step in preparing land for irrigation is the removal of this native vegetation. When this consists of native grasses, low cacti, or small bushes they can be plowed under or removed without much extra expense, but when it consists of large sagebrush, mesquite, or greasewood, the cost is high and the task of removing it may require special implements. Of all the desert plants sagebrush is the most common. Formerly the grubbing hoe, or mattock, and plow were the only implements used to remove this bush. Breaking down the branches and then digging out the roots before attempting to plow proved laborious. By this process the cost of grubbing, gathering the brush into piles, and burning varied from \$2 per acre in light sage to \$5 per acre in heavy sage. Of late, farmers who are well provided with work teams greatly expedite the work and reduce the amount of manual labor by first dragging a railroad rail or heavy timber over the sagebrush. This work can be done best when the ground is frozen. If only two teams of two horses each are available, one rail will suffice,

but with six, or, better still, eight horses, four at each end, two railroad rails may be bolted together. If iron rails cannot be had, two large logs chained together make a good substitute. In railing brush, as it is termed, the rails are dragged at least twice over the same trip, but in opposite directions. The few stumps which remain are then grubbed out by hand or left to be plowed out and the brush raked into windrows and burned. A brush rake may be made of a 6-inch timber 12 feet long, by boring 2-inch holes through the timber, 10 inches apart, and inserting in each a wooden tooth about 3 feet long. The rake is then fastened by two joists to the rear of a wagon to which a team is hitched. In the San Joaquin and Imperial valleys of California the railroad rail is bent in the form of a V, but it is a question if this form has any advantages over the straight rail. A more effective implement for light brush is sketched in figure 2. From 8 to 12 horses are hitched to it and 20 acres may be cleared in one day. In Kern county, Cal., a 6 by 12-inch timber, 24 feet long, shod with steel, is preferred. The steel shoe projects about half an inch and a board on the back, similar to that of a buck scraper, serves to keep it in position. A team is hitched to each end, crossing the field and returning on the same track. The cost of the removal of sagebrush by means of teams and a minimum amount of hand labor runs all the way from \$1.50 to \$4 per acre, depending on the character and extent of the growth.

In the Imperial Valley of California, the Rio Grande Valley of New Mexico and Texas, and in parts of Arizona, the mesquite tree is quite troublesome to remove. This usually has to be grubbed out by hand and the cost varies from \$5 to \$40 per acre, depending on the number and size of the trees. Oscar Snow has 600 acres in alfalfa in the Mesilla Valley, New Mexico. In its natural state the

land was covered with a dense growth of tornillo, mesquite and shad scale. He states that it cost him \$40 to \$50 per acre to cut the brush, grub out the roots, grade the land, and seed it to alfalfa. The usual price paid for grubbing out mesquite bushes in Salt River Valley, Arizona, is 30 cents per tree and the cost may run as high as \$100 per acre. The larger trees have usually some value as firewood and fence posts.

Mr. Hubbard, of Weiser, Idaho, rids the raw land of sagebrush and plows it to a depth of 8 inches before grading and leveling the surface. Whenever possible, this work is done in the fall and early the following spring the tract is thoroughly disked and harrowed. He prefers flooding the tract before seeding in order that the water may show us the low as well as the high places and also to insure ample moisture for the speedy germination of the seed. When the surface dries out sufficiently to pulverize after the harrow, it is seeded. In this part of Idaho the cost per acre for removing sagebrush varies from \$2.50 to \$4; for plowing, \$2.50 to \$3; disk-ing, 50 cents to 75 cents; harrowing, 35 to 50 cents. Grading and leveling are discussed under another heading.

In localities covered by native grasses, nothing more is necessary than plowing and thorough cultivation. The native grass lands of Montana are usually plowed 2 to 5 inches deep in the fall. In the spring the surface is double-disked, perhaps cross double-disked, harrowed, and leveled, and then seeded to grain rather than alfalfa, in order to properly prepare the surface of the ground for the later crop.

The cost of plowing new land in Kern county, Cal., where the surface is covered with low sage, wheat, and wire grasses, runs from \$2 to \$4 per acre, depending chiefly on the depth of plowing, which is usually more than 4 inches and less than 10 inches. On the extensive holdings of Miller & Lux traction engines are used to operate gang plows, followed by harrows. By this means, it is claimed, the cost can be reduced to between 75 cents and \$1 per acre.

In all the older irrigated sections of the West alfalfa

(Continued on page 183.)

Irrigation Bonds Under Carey Act

By Mark Bennitt

Bonds issued on account of irrigation projects undertaken by authority of the Carey act are among the best known of securities of this class. The Carey act has afforded a plan for irrigation development with private capital, whose success is without parallel.

The great work of the Government under the reclamation law calls for no assistance from bond houses or private interests of any sort. Such public lands as may lie within the area to be irrigated by a Government project is at all times available for entry under the homestead act, and the patented lands come under an arrangement whereby no person shall have more than the farm unit decided upon under the project.

On the other hand, the Carey act furnishes a splendid means for private enterprise and investment. The procedure under the Carey act is in the main as follows: The initiative is taken by a private individual or company. The first step is to make a filing upon the waters available for irrigation and then to secure the segregation of the lands which may be irrigated from the stream or proposed reservoir.

In all this work the private parties must have the cooperation and assistance of the State Land Board. It is the duty of the board, on approving the project, to apply to the Federal Government for the segregation of the land. The application must be accompanied by a full statement of water supply and all necessary data to justify the segregation. Then follows a Government investigation of the project. The price of the perpetual water right is fixed in the beginning by agreement between the irrigating company and the state. This having been done, the company is allowed to go ahead with construction. An opening day for the sale of the land and water rights is announced. On this occasion the State Land Board and the private company work together, the state selling the land at 50 cents an acre, the price named in the Federal statute, and the water right being sold at the fixed price, which cannot be increased. The law requires that each applicant for land must sign a contract for a water right before he may enter the land. It is this provision that is so advantageous in the protection of the invested capital, the ordinary homesteader being excluded.

The success of the sale of lands under the Carey act depends more or less upon the reputation of the private organization which is undertaking the project. During the first year that the law was enforced there were numerous failures by reason of miscalculation as to cost and by unsuccessful advertising, and other causes. The state exacts a sufficient bond from the private organization to insure the performance of the contract. This also protects the settler. During the last two or three years the demand for irrigated land has become such that it frequently happens that large tracts are sold out immediately on the opening day or soon thereafter.

The price of the perpetual water right is based upon the cost of construction. All the details of construction must be approved by the State Land Board. A small down payment is made on the water right by the entryman, and the contract is signed for the full right. These

contracts under the law constitute a first lien on the land and are the equivalent of a first mortgage. It has been the practice of bond houses to deposit these contracts with the trustee as collateral for the bonds at the rate of \$1.25 for each dollar of bond issued. Sometimes these securities are in the form of serial payment bonds, the payments extending through a period of ten to fifteen years; in other cases term bonds are issued to run two, three, four or more years up to the full period of payments on the water rights. As the water rights are all paid for serially, the short-term issues are promptly retired. In this case, as in the case of district bonds, the standing of the trustee and the bond houses have an important bearing on the salability of the securities.

Where the state exercises strict supervision of construction and where the bond issue is ample to cover all contingencies, the safety of the investment is well assured. Ultra-conservative investors are now seen buying these securities.

Water rights under the Carey act are now selling at from \$45 to \$65 and even up to \$125 an acre. Conservative financiers estimate that under general conditions now existing in the irrigating regions a bond issue of \$25 per acre is justified. The fact that the value of the lands is immediately increased by occupancy is reassuring to the investor. Occupancy necessitates improvements of a permanent character. The purchaser of land and a water right under one of these irrigating systems can ill afford to allow his property to remain idle. The generous productiveness of the land under irrigation is such as to attract the best farmers. The trained farmer, especially the one who has scientific knowledge, is quick to appreciate the immense money-making value of the land which has a controllable water supply always available for immediate use.

Irrigated land is generally of very high quality because it is usually river bottom land or bench land where the soil is deep, and it has never been subjected to the copious rains which wash out much of the plant foods in the rainy country.

Chicago bond houses have become heavily interested in irrigation. Some of these have placed large issues with their customers all over the country, and so prompt have payments been, both of interest and maturing bonds, that these securities are rated very high when put out by well known and conservative houses.

The Twin Falls country of southern Idaho is the source of many of these bonds. The gigantic works which have been constructed for irrigating portions of the Snake River Valley have involved the expenditure of many millions of dollars. Still greater works are in process of construction and others still are contemplated. More than a million acres of land in this region alone will be irrigated under the Carey act before the completion of projects now in hand.

A sale of land under the Carey act was recently held at Milner, Idaho, when nearly 30,000 acres were sold at \$65 per acre.

Another sale under the Carey act had taken place a few days before at another point in the great valley, where an equally fine class of people representing many Eastern states were in attendance, and where nearly 50,000 acres were sold at \$40 per acre. Under good management Carey act land sells out at once, furnishing a strong underlying value for the bond issue.



A View of the First Pumping Plant on the Ranch of Tarr & Sellers, Platteville, Colo. A tee is placed in the pipe line 100 feet from the pump. The elevation of the tee above the pump at this point is 12 feet. A Dempster 12 H. P. Horizontal Four Cycle Gasoline Engine and a No. 5 Gould Submerged Vertical Centrifugal Pump are lifting 120 inches of water per minute. At this rate one acre would be covered one inch deep in about 20 minutes. One acre of water a foot in depth would be pumped in about four hours.

RESULTS OF IRRIGATING WITH A SUCCESSFUL PUMPING PLANT.

The 12 horsepower horizontal gasoline engine and a No. 5 centrifugal pump sold by the Dempster Mill Manufacturing Company, Beatrice, Neb., to Tarr & Sellers, was installed late in 1908 and in the season of 1909 was used to irrigate 60 acres of wheat and 12 acres of potatoes.

gasoline and lubricating oil was 91 cents per acre for pumping water to the wheat through 600 feet and 800 feet of 10-inch pipe at elevations of 18 feet and 25 feet respectively. For the 12 acres of potatoes the cost was slightly under \$1 per acre. The cost for repairs was nothing. The crop of wheat averaged over 35 bushels per acre, but no report on the potato crop was received.

With the engine and pump and plenty of available water the operation has all the advantages of the ditch.



The 60-acre Wheat Field Irrigated with the Pumping Plant shown Above.

Florida and Sub-Irrigation at Sanford

J. N. Whitner, Sanford, Florida.

The most inviting fields for enterprise, brains and money are the undeveloped resources of new countries, and while Florida is old in point of discovery and early settlement, the peninsular, which is the part you know of, is new, very new. From the standpoint of development, barely fifteen years old, for the developments there date from the freeze of February 8, 1895, when in one night Florida lost \$100,000,000 in orange groves, her principal industry.

As far as I know, this is the only disaster of similar magnitude where no assistance was asked or received and it speaks volumes to say there was no suffering and her people turned to other things, thereby making her richer and a thousand times more independent than before. Since then, besides bringing our orange and grape fruit groves to a greater state of productiveness and of better fruit, as well as a more profitable basis, we have begun along other lines. Florida has become and will continue to be the great source of phosphate, naval stores and lumber productions. We are improving our stock on pastures where grass grows and is green twelve months in the year. This field is almost limitless. The production of fine tobacco for cigar wrappers is a big success. Pecan and other nuts are being grown. On the east coast pine apples and other tropical fruits have made that section famous and rich. The trucking industry is reaching magnificent proportions. But as yet, these are all in process of development and the possibilities unknown.

To show what has been done in one locality, Sanford, Florida, I am going to tell you about Sanford Sub-irrigation and its results.

Let me describe the system, its operation and theory: then, with your permission, tell you something of what it has done for us. Its possibilities seem limitless. Without an illustration or drawing, a description is difficult to understand or remember. I have, therefore, brought a sufficient number of illustrations, a glance at which will give a full understanding. These are for free distribution at the Florida table, or will be mailed upon request. Briefly stated, the water is applied through 3-inch tile, laid in parallel ditches 18 inches deep, with a fall of not less than one inch to the hundred feet. The distance between the rows of tile varies according to quality of soil; in our sandy loam 25 feet affords effective drainage, as well as irrigation. The more clay and the stiffer the soil, the nearer they should be placed. At the upper end of the tile, beginning at the water supply (with us, flowing or artesian wells) and running by the end of each row of tile, is a water main; the cheapest being small sewer pipe cemented at the joints. Between the tile and this water main a joint of 6-inch sewer pipe is used as a stand-pipe, connected by a short iron pipe on one side with the main, while on the other is a connection with the tile. It will readily be seen that water turned into the water main, and running by each of the stand pipes, can be turned into as few or as many as desired, in this way irrigating all or any portion of the field. Of course, the tile is in short joints, with us, one foot in length, and the water finds ingress or egress at the joints, porous tile being largely a myth. At the lower side of the field the tile discharges into a waste ditch, and when the ground is level and the flow of water not too rapid, it will be found that capillary attraction supplies all the moisture needed, even for setting plants, but most fields are equipped with stop boxes at the lower end of tile, and when ground is much broken, these boxes are placed at intervals, as required, and the illustration shows how the water is dammed up to any level required, even to flooding the ground.

This much for irrigation. It is quite as effective for drainage, being laid on an incline, and water applied

by gravity. In case of rain the excess is taken off very quickly and on our soil if it rains three inches today we can plow tomorrow. This, we find, is of inestimable value, for with the soil saturated with water, as the small boy would say, there is nothing doing, or, as one of your western farmers put it, "You can't get no action out of the ground." The reason of this inertia, as you all know, is that the water excludes the air from the ground. Now with surface irrigation, and without this sub-drainage you have to wait for the water to evaporate, which slowly drying from the surface, inch by inch, lets in a little air from above, while the plants await the life-giving air. With our system, as soon as the water stops running the tile become a conveyor of air, which is supplied, so to speak, from both top and bottom. Our system not only does these things, but furnishes warmth from below, and as warm air rises from the tile, it has a marked influence on the growing crop, especially in winter when our most profitable crops are grown, for with us September and October are seed time, and February and March the harvest.

You can understand that it matters little to us whether it rains or not, for during the winter of 1906 it rained frequently and in torrents, while the next year we had not a single rain from September 15th to April 5th, yet raised equally as good and profitable crops. So rain is not necessary to plant, grow or perfect a crop.

As yet your principal crops are celery and lettuce for the northern markets, and I quote from the State Department of Agriculture for the crop of 1907-8, Volume 8, Page 129, as follows:

Lettuce... 139 acres, 97,180 crts., \$132,587 or \$953.86 per A.
Celery... 209 acres, 209,185 crts., 402,300 or 1,924.88 per A.

Total, where celery follows lettuce....\$2,878.74 per A.

I have not seen the report for 1908-9, but the results were certainly as good. These figures for 1907-8 do not mean two years, but one, running from November of one year to June of the next, that being one crop season. Now, with your kind indulgence, I want to tell you a few of the things we have accomplished by this unique and wonderful system of irrigation: In the spring of 1898, I had the honor to ship the first four carloads of celery from Sanford, this being the first year we used sub-irrigation, and the first carload of produce of any kind following the freeze of '95. The past season from this one point, we shipped 1700 carloads, exclusive of express shipments, making in all close to 2,000 carloads, the estimated income of same being \$600,000, from approximately 800 acres of land. It is certain that one brokerage firm, Chase & Company, paid the growers \$275,000 for the portion of the crop they handled. We have one grower, C. F. Williams, who sold from measured five acres in celery \$30,680 in three consecutive years. L. A. Brumley bought 1½ acres with crop on it, in March, 1908, and in fourteen months sold \$5,000 worth of celery and lettuce from the 1½ acres. T. V. Denton, a New York commission man, told me that last season he paid a Mr. Allison \$1200 for the lettuce on one acre, which was then planted in celery, for which he paid him \$1,800, making \$3,000 the past season from one acre. Is it any wonder, then, that we estimate a revenue to railroads of \$700 per acre on our sub-irrigated farms. And if you will add \$700 to the above known yields, and tell me what our sub-irrigated lands are worth, figures on an interest-bearing basis, I will thank you.

As to the value of these lands, ten years ago, before sub-irrigation was adopted, 1,000 acres of these Sanford Celery Delta lands were sold for 25c an acre. That fall, just ten years ago, H. H. Chappell, being fortunate enough, by the sale of the railroad he was working for, to lose his position, began farming on this then new plan of sub-irrigated lands, practically without means. On the 25th of October just past, he bought 35 acres of sub-irrigated lands just across the road from his farm, where he made the money, and paid \$35,000 for it. He paid, in addition, for the labor and fertilizer already expended for this season's crop, making the purchase price over \$40,000 for 35 acres. This 35 acres being a part of the land sold at 25c ten years ago. Please note this was no land boomers' sale to a stranger.

Supreme Court Decisions

Irrigation Cases

RIGHT TO STORE WATER.—

The right of a riparian owner to the water of a stream for irrigation purposes is not confined to a use of the water as it flows by, and while it is so flowing, but he may store the water in reservoirs for future use after it has ceased to flow so far as is consistent with the rights of the lower owners, but such use of the water by one owner as will prevent a lower owner from storing water for irrigation is not reasonable.—*Stacy v. Delery*. Court of Civil Appeals of Texas. 122 Southwestern 300.

USING STEAM AS CONDUIT.—

Persons who use a stream, the waters of which have been appropriated, as a conduit for other waters, can take out only what they put in, making allowance for natural waste and evaporation and for cutting off or drying up any original tributaries of the stream.—*Miller v. Wheeler*. Supreme Court of Washington. 103 Pacific 641.

DIVERSION.—

GOVERNMENT IRRIGATION WORKS.—

The fact that an irrigation scheme projected by the government under Irrigation Act June 17, 1902, c. 1093, § 1, 32 Stat. 388 (U. S. Comp. St. Supp. 1907, p. 511), contemplates the irrigation of private lands, as well as a large tract of government land, and that the owners of the private lands are assisting and co-operating therein, does not render the project illegal, nor deprive the Secretary of the Interior of the power given by the act to condemn lands necessary to carry it out.—*United States v. Burley*. U. S. Circuit Court, Idaho Central District. 172 Federal 615.

LIABILITY FOR FLOWAGE.—

An irrigation company which negligently constructed the intakes from the Colorado river into its canal without head-gates or other means of controlling the flow, by reason of which in a time of flood the water flowed through in such volume as to wash away the river bank and overflow the lands of others, is not relieved from liability therefor by the fact that the flood was extraordinary.—*The Salton Sea Cases. California Development Co. v. New Liverpool Salt Co.* U. S. Circuit Court of Appeals. 172 Federal 792.

CONTRACT TO SELL LAND.—

Plaintiff contracted to sell to defendants a tract of land, with water therefor to a certain amount, the price to be part cash and part deferred payments. The contract also provided that plaintiff should furnish the water between certain dates of each year. Held, that the provision as to the time for furnishing water was an independent continuing covenant, upon which the promise of defendants to pay did not depend, and when plaintiff had delivered possession of the land it was entitled to payments as agreed.—*Spokane Canal Co. v. Coffman*. Supreme Court of Washington. 103 Pacific 1106.

DEED TO ENTRYMAN.—

A deed executed by an entryman before he is entitled to a receiver's final receipt and purporting to vest the grantee with a right of way over, and the privilege of constructing and maintaining a reservoir upon the lands of the entryman, will not vest the grantee with any right against a subsequent entry of the land under the acts of Congress, unless such grantee, before the last entry, shall have constructed said improvements, and was using them under such circumstances as to entitle him to protection under the laws of this state.—*Rasmussen v. Blust*. Supreme Court of Nebraska. 122 Northwestern 862.

ACQUISITION OF RIGHTS IN PUBLIC LANDS.—

One who has constructed upon the vacant public lands of the United States a system of reservoirs and ditches for the distribution of water appropriated by him for irrigation purposes, and has secured the approval of his plan and appropriation by the state board of irrigation, and was using his said reservoirs and ditches for the storage and distribu-

tion of such waters before said lands are entered, has a vested and accrued right within the meaning of sections 2339 and 2340 of the Revised Statutes of the United States (U. S. Comp. St. 1901, p. 1437).—*Rasmussen v. Blust*. Supreme Court of Nebraska. 122 Northwestern 862.

APPROPRIATIONS—ABANDONMENT.—

The overflow or waste, after use on defendants' land, of waters which they appropriated and brought there, was not abandoned, so as to be subject to the use of others, unless there was a concurrence of intent to abandon and an actual relinquishment.—*Miller v. Wheeler*. Supreme Court of Washington. 103 Pacific 641.

"ABANDONMENT."—

The mere temporary nonuse of water during one year subsequent to its appropriation, without intent to abandon the appropriator's right is insufficient to establish an "abandonment."—*Land v. Johnston*. Supreme Court of California. 104 Pacific 449.

CONTRACTS FOR SALE OF WATER.—

The owner of certain lands and water rights constructed a canal to carry the waters from his land to lower lands, and entered into contracts with the owners of such lands by which he sold and conveyed to each a certain quantity of water, measured at the canal. The contracts provided that "it is understood and agreed * * * that water as above stipulated has been actually delivered to the vendee, and that said delivery and this conveyance are accepted by vendee in full satisfaction of all obligations of vendor to vendee." All of them also provided, in effect, that "vendee hereby covenants and agrees to bear his proportionate share of taxes and all expenses of maintaining and operating said canal system and all water sources and water rights and structures that may be connected therewith." Held, that such contracts must be construed to require the vendor to furnish continuously the stipulated quantity of water, and the covenants of the vendees to bear a proportionate share of the expenses related to the expenses of delivery only, and did not bind them to contribute to the expense of producing the water, or procuring additional sources of supply, when by reason of drouth the original supply became inadequate to fill the contracts.—*Riverside Trust Co., Ltd., v. East Riverside Water Co.* U. S. Circuit Court of Appeals. 173 Federal 241.

FAILURE TO FILE MAP.—

The failure of the irrigator to file a map in the land office and to secure the approval of the secretary of the interior in accordance with the act of Congress approved March 3, 1891 (Act March 3, 1891, c. 561, § 18, 26 Stat. 1101 [U. S. Comp. St. 1901, p. 1570]), entitled "An act to repeal timber-culture laws, and for other purposes," and the acts supplementary thereto, does not destroy the privileges protected by sections 2339, 2340, Rev. St. U. S. (U. S. Comp. St. 1901, p. 1437).—*Rasmussen v. Blust*. Supreme Court of Nebraska. 122 Northwestern 862.

CONDEMNATION BY UNITED STATES.—

In a proceeding by the United States to condemn land for reservoir purposes under Irrigation Act June 17, 1902, c. 1093, § 1, 32 Stat. 388 (U. S. Comp. St. Supp. 1907, p. 511), whether a more feasible plan of irrigation than the one adopted might be devised, or some other site selected for the reservoir, is immaterial; the determination of the proper government authorities being conclusive.—*United States v. Burley*. U. S. Circuit Court, Idaho, Central District. 172 Federal 615.

OVERFLOW THROUGH A BREACH.—

Defendant by the negligent construction of the works by which it diverted water from the Colorado river into its irrigation canal caused an overflow through a breach in the bank, creating a lake in the Salton Basin, which covered and practically destroyed the value of complainant's property situated in the basin. In a suit by complainant it was awarded damages for the injury, and also an injunction restraining defendant from diverting water from the river in excess of the substantial needs of the people dependant on its canal, from permitting any waste water to flow on or over complainant's land, or into the lake in such amount as would "sub-

(Continued on page 181.)

Irrigation by Deep Well Pumping

E. B. KIENTZ, NILES, CAL.*

"Reclaim the Deserts" and "Make Homes on the Land." These are two of the four cardinal objects of this Irrigation Congress and they can be accomplished only through irrigation.

It behooves us, therefore, to give publicity to any method of irrigation which has been found practical by thorough trials, and the more general use of which will make large areas of our arid and semi-arid western country of greatly increased value and productiveness.

A great deal of our land can and is being irrigated by the gravity system, but in all districts supplied by this system there are large areas of fertile land, that, owing to the contour of the land, can not be irrigated with gravity water, but have an abundant supply of water below the surface within a practical depth or lift of deep well pumps.

In view of the fact that there are such large areas that can only be irrigated by deep well pumping and the consequent important part this method will play in the development of the West, and as suitable machinery for this method of irrigation is of comparatively recent design and manufacture, it is particularly opportune that we should give to this subject our serious consideration.

Deep well pumping, as the term is generally used and accepted, means pumping from a source below the surface beyond suction limit. Until recent years, if water could not be secured within the suction limit it was not considered a feasible proposition to attempt to pump water for irrigation purposes. But it had been shown what could be done by irrigation, and this was an incentive for those owning land that could not be supplied by other systems to irrigate also. Their only alternative was deep well pumping. Hence a great need was felt for a pump that would deliver an irrigating head from below suction limit to or above the surface efficiently and make irrigation, under these conditions, practical and profitable. Such a pump, it was fully realized, would prove of unknown value in developing arid and semi-arid lands.

The ordinary type of double deep well plunger pump was found to be impracticable for this work because each bucket completed its stroke at the instant the other commenced and both were on the dead center at the same time, causing a stoppage in the upward flow of the water and the necessity of starting the long water column from rest twice in each revolution of the pump, and that both clappers must close under the full pressure of the water column. The load on the buckets changing instantly from nothing to full load twice in each revolution caused a heavy shock or water hammer on the moving parts, and not only shortened the life of the pump, but a large part of the useful power applied was wasted in starting the water column from rest at the end of each stroke.

To overcome this obstacle in deep well pumping it was realized that it would be necessary to construct a double plunger pump that would produce a continuous stream of water from deep bored or dug wells efficiently. To meet this demand a type of pump was designed since known as the double plunger continuous flow deep well pump. This type of pump overcame all the foregoing objections by keeping the water column in constant motion upward, without stopping at each stroke, thus permitting high piston speed and great capacity, a saving of the power lost in starting the water column from rest and eliminating the shocks on the moving parts. This is accomplished by a patented two sets of eccentric gearing in each powerhead, each bucket in the cylinder in the well being connected to the crankpin of a gear by steel rods. Each gear is on a separate shaft, independent of the other, and driven by a long double eccentric pinion. Both pinions are keyed fast on the same pinion shaft. Uniform revolution of the pinion shaft produces uniform upward motion of the buckets, but the down stroke is made in less time than the up stroke.

As the upper bucket carries the load up, the lower

bucket, with clapper wide open, travels down at a higher speed, passes the lower dead center, and travels part of its up stroke before the upper bucket has passed the upper dead center. As the lower bucket rises, it reaches a point where its speed is exactly equal to the speed of the upper bucket, when the lower clapper closes, and the lower bucket takes the load. As the lower bucket is then traveling at exactly the same speed as the upper bucket, and consequently at the same speed as the water column, it follows that it takes the load without shock, no matter what the piston speed may be. It is like giving a push to a moving body instead of starting the same body from rest.

This action of the valves, termed lap, takes place with each bucket alternately, or twice in each revolution of the pump, and this combination of a spur gear with a crankpin is the simplest and most efficient known way of producing such action. There are no cams, levers or exposed sliding surfaces and in combination with the other mechanical features of these pumps is the best and most economical way of pumping water.

This design not only gave great efficiency, but durability as well because there is no undue strain on any part in operating. These are two all important points in deep well pumping for irrigation as the cost of irrigation by pumping is not the cost of the initial installation, but is the cost of operation and maintenance, which the above described type of pump reduces to the minimum, attaining an efficiency as high as 70 to 80 per cent.

With this perfection of suitable machinery by which deep well pumping for irrigation was made successful and extremely profitable, this system of irrigation has come to be preferred even where gravity water is available. The reasons for this are: A person owning his own irrigation plant is more independent, he can irrigate when he wants to and when he can do so to the best advantage; the water is pure and free and there is no danger of scattering the seeds of obnoxious weeds and plants, which are liable to ruin any crop; there is no loss from evaporation and seepage.

The first thing to consider in deep well pumping is an adequate water supply usually procured from bored wells. All over our western country there is a large supply of water below ground which only needs to be brought to the surface to transform the barren plains into gardens of productiveness.

The wells should be bored large for two reasons: First—It gives more area for the water to get into the well. Second—A larger cylinder can be used which will deliver a greater amount of water. The largest diameter of cylinder that can be used in a 10-inch well is 8-inch, using 9-inch O. D. casing for column pipe and having a capacity of 300 gallons per minute. A 9-inch cylinder can be used in a 12-inch well using 10-inch O. D. casing for column pipe with a capacity of 400 gallons per minute, or a 11-inch cylinder using 12-inch O. D. casing for column pipe in a 14-inch well with a capacity of 600 gallons per minute.

The well should be cased and casing perforated at each water strata, either before or after the casing is put into the well. It is much the better plan to perforate the casing in the flat before it is rolled.

As will be noted from above, in all installations of deep well pumps, the pump column pipe in well connecting cylinder in well to powerhead at surface is of larger inside diameter than the cylinder. This allows the valves to be pulled for repairs without taking the pump column out of the well, and the large pipe also reduces the friction to the minimum. The pumps deliver either at the surface or through long pipe lines at high heads above the surface, as desired.

The hydrostatic pressure of water is $33\frac{1}{3}$ feet, that is water will rise to a height of $33\frac{1}{3}$ feet, in a perfect vacuum, at sea level, but in practice, with the most perfect of suction pumps, it is necessary to place the pump within 20 feet of the water level when pumping, in order to operate. This is impractical when the water level is at a great distance below the surface. Pits are sometimes dug to place centrifugal pumps within the suction limit, but there are two objections to this method: First—The cost of the expensive pit. Second—The necessary low efficiency of the centrifugal pump makes the cost of operating excessive.

*Address delivered at Seventeenth National Irrigation Congress.

A complete well pump consists of the power head carrying the driving pulley, gearing and piston rods; the cylinder and valves; the inside and outside pump rods connecting the buckets with the power head at surface, the guides on the outside rod, and the pump column connecting the cylinder with the pump head at surface. The check valve, discharge elbow, discharge pipe, air chamber, pipe line above surface and other fittings as needed.

The power head is placed on the surface of the ground and may be driven by steam or gasoline or electric motor, belt driven or direct connected. The driving pulley is furnished to suit the type and speed of the motive powers, using a friction clutch pulley when driven by engine or jack shaft, or a plain tight pulley when driven by electric motor.

The cylinder is placed at a point in the well where it is always submerged and requires no priming. In all cases the work is done in one lift from water level to point of discharge, no matter how deep the water level below the surface or how high the point of discharge. No expensive pit is required to bring the pump within suction distance of the water, as in all centrifugal or plunger pumps depending on suction.

It is very hard to give the exact cost of irrigation by pumping, because of the varying conditions, and I do not know that I could do better than to explain what deep well pumping has done for California. I merely mention this state because I am more familiar with it than others, and what has been accomplished in California by this method can be repeated all over the western country.

Up to eight or ten years ago irrigation was unknown there, except by the gravity system and centrifugal pumps which were expensive to operate. But as soon as the deep well pumps were introduced and proved successful they at once came into prominence and they are now used almost exclusively in California. In the past six years hundreds of deep well pumps have been installed in California with capacities ranging from 100 to 600 gallons per minute.

There being an abundance of water, the use of deep well pumps has made gardens out of sections of California that for many years was looked upon as only good for grazing and for raising grain on a wet year. Land in these sections eight to ten years ago sold at \$5 to \$8 per acre; it is now selling at \$150 to \$200 per acre unimproved, brought about by the fact that they know by boring wells and installing deep well pumps their water supply is assured and their land made valuable and productive.

If this had not been demonstrated by the use of deep well pumps, this land would still be worth only \$5 to \$8 per acre, as it would still be only grazing or wheat land. Orange orchards in California, five or six years old, that have been properly cared for, produce from \$150 to as high as \$500 per acre per year, and the grower in some few instances has received as high as \$1,000 per acre, but this of course is exceptional. It is not uncommon to net \$300 per acre from a 6-year old orchard and it would not be looked upon as anything to attract particular attention. I merely mention these facts to show what irrigation, through deep well pumping, has done for one state in our great West.

In most districts in California where deep well pumps are employed, the water stands all the way from 50 feet to 300 feet from the surface, and in many installations of deep well pumps the cylinder is placed 300 feet below the surface and water has been pumped very successfully from these depths. Until recently water at this depth would not be considered as available for irrigation purposes, but it is thought nothing of at this time. There is a great deal of land in California, not irrigated as yet, where the water will have to be lifted not less than 200 feet and from that up to 300 and 400 feet, and this will all have to be irrigated by deep well pumps.

In many places pumps are kept in commission all winter ready to operate at a moment's notice, especially in sections where there is apt to be frost, as it has been found that the water pumped from below the surface, being much warmer than the atmosphere, and run through the orchards on a cold night, forms a mist or fog which lies like a blanket over the whole orchard and prevents frost from affecting the trees or fruit. It is used instead of

smudge pots, as it has been found much cheaper and quicker and more efficient than the old method. Self registering thermometers are installed which ring a bell as soon as the temperature in the orchard has fallen to the danger point, and in 30 minutes from that time there is water through every furrow in the orchard and the temperature has risen about 5°. This system has proven successful wherever tried, no fruit being lost by frost.

From the foregoing it will be seen that deep well pumping has proven successful wherever tried. While still in its infancy deep well pumping for irrigation has accomplished a great deal in reclaiming arid and semi-arid lands, and as there is a spirit in this congress of "Let all profit by our experience," I wish to leave with you this account, showing what this system can be made to do to "Reclaim the Deserts and Make Homes on the Land," that our great and beautiful western country of the land we know and love may come into its own, and let us work together to accomplish this through irrigation by the system best suited to the existing conditions.

ALKALIED LANDS.

In the November circular issued by the Colorado Agricultural College is an article of considerable interest relating to the reclamation of lands whereon alkalies have interfered or wholly prohibited the raising of crops. In connection with this problem, Prof. E. B. House offers the following suggestion:

"Considerable areas in the State of Colorado have become in late years strongly alkalied. Good crops used to be grown on this land, but as time has passed irrigation waters have been poured upon the land year after year, the water table has risen, and gradually the alkali has worked to the surface as the water from below has risen by capillary attraction and evaporation. The ground has gradually whitened, yields have decreased year after year, the growth of "Alakli Weed" has increased, and finally the land has been abandoned because it would not pay.

"This question is then asked by the farmer: What can I do to redeem this land? The answer for most cases is as follows: Drain it, flood it, and give it deep cultivation. Draining it lowers the water table. Flooding it dissolves the alkali crust at the surface and carries it away in solution, or carries it downward to the drains and it passes away through them. Deep plowing and cultivation mixes what remains through the upper foot of soil instead of leaving it at the surface. Good crops can now be grown. Some of the very worst alkalied lands in the world have been redeemed in this way. 'But,' says the farmer, 'I'm a busy man, money is scarce, and it takes time, work, and money to drain a field.'

"True, farmer, all very true, and now that winter is coming on and the ground will soon be frozen, let me suggest this as a temporary remedy: Next spring, when the water is turned into your ditch, put on your gum boots, get out with your shovel, and give this land a thorough flooding. As soon as it then becomes dry enough to plow, plow it good and deep, plant your oats, or wheat, or potatoes, and although by this flooding you raise the water table and the alkali begins to collect at the surface again, yet before it collects in sufficient quantities to do any real damage, your crop will have matured and a good crop harvested.

IRON HEADGATES.

The twenty-acre model irrigated farm at the Seventeenth National Irrigation Congress, at Spokane last year, proved a most instructive and interesting exhibit. One of the strong points brought to the attention of irrigation companies and irrigators was that to have a water supply absolutely safe and under perfect control, iron headgates must be used in the reservoirs and irrigating ditches.

Old-fashioned wooden gates, besides being unreliable and unhandy, are responsible for the wasting of much valuable water by the individual irrigator. The company's water supply and the farmer's crops are never safe where wooden gates are used, because wooden gates invariably fail and wash out just when the water is needed to save a burning crop.

The gates used on the demonstration farm were "North-western Iron Headgates." They demonstrated their advantages over wooden gates so completely that it is a question of only a few years when every up-to-date farm will be equipped with iron headgates.

Reclamation Notes

COLORADO.

In the Syloam and Boggs flats country near Florence farmers are irrigating by pumping with success.

The Henrylyn irrigation district has begun condemnation proceedings against the Western Land Company to obtain title for its west reservoir of canal No. 2.

The Greeley-Poudre irrigation district has recently let the contract to Kingsbury Bros. for the construction of the March reservoir in the center of the district, 12 miles east of Ault.

Farmers in the Hardscrabble country have organized an irrigation district composed of 20,000 acres. Filings have been made on water of Hardscrabble creek and reservoir sites have been surveyed.

Announcement is made that the immense project in Routt county in which La Fayette Hughes, son of Senator Charles J. Hughes, is interested, has been financed and that contracts will be let shortly for construction work.

The Denver Reservoir Irrigation Company has recently purchased 20,000 acres in southwestern Weld county. With its auxiliaries this company now controls 125,000 acres and has rights to 400,000 acre feet of water.

Colorado Springs capitalists are interested in a project for the reclamation of 30,000 acres near Breed, six miles north of Colorado Springs. Reservoirs will be constructed on Cottonwood creek. H. B. Neff of Colorado Springs is interested.

The entire bond issue of the Laramie Poudre Reservoir & Irrigation Company, amounting to \$5,100,000, is said to have been sold to Farson, Son & Co., of Chicago. E. A. Camfield recently stated that contracts were to be let and actual work begun at once.

Farmers owning 50,000 acres in the district to be watered by the Purgatoire Irrigation Development Company's system have approved the plans for organization and construction. State Treasurer A. E. Bent is interesting himself in this project.

Contracts for extending the Sunnyside canal for a distance of eighteen miles east of Hudson have been let at a cost of \$500,000. It is claimed that the total amount required for construction purposes and purchase of land as now outlined by the company will aggregate \$2,500,000.

Canon City fruit growers have interested Colorado Springs capitalists in a proposition to reclaim 1,400 acres of land by the use of hot water from the natural springs. It is claimed that this hot water will not only prevent frosts but will supply moisture for crops. Two reservoirs will be constructed. Thomas C. Pease of Denver is fiscal agent.

The Kiowa Valley Reservoir and Irrigation Company has recently filed maps of 20,000 acres in Arapahoe and Elbert counties, twenty miles from Denver, which it is proposed to irrigate at a cost of \$500,000. Lee A. Reynolds has promoted the company and A. E. Jackson is general manager. C. D. Griffith, H. S. Coovey, Arthur Keenan and others are interested. Four reservoirs will be constructed.

J. A. Tuttmann of Montrose is interested in an irrigation project in Custer county, plans for which have recently been made public. It is proposed to irrigate 12,000 acres in the southwest end of Wet Mountain valley by water from San creek, one of the strong flowing streams in the Sangre de Cristo range. A dam will be constructed at the head of the creek and water will be carried down the east slope of the mountain. The project is said to be financed.

The Bear River Irrigation and Construction Company, with a capital of \$500,000, has been incorporated. It is proposed to construct an irrigation system in Routt county to reclaim 60,000 acres lying south of Hayden. Water will be taken from Bear creek below Steamboat Springs,

also from Trout and Grassy creeks. George Bancroft is the engineer in charge. The cost of the project is estimated at \$1,000,000. Incorporators are T. E. Garrett, R. G. Bardwell and Wm. Jameson, all of Denver.

In connection with the contract as let by the Henrylyn district for the construction of its system at a cost of about \$4,500,000 to the Camfield Development Company, it is stated that there is a controversy between the Henrylyn Company and the Denver Irrigation Company over the control of land in the Henrylyn district. Stockholders in the Henrylyn company charge that the Denver Reservoir & Irrigation Company is trying to defeat its plans. Stockholders in the Henrylyn district will be called upon to vote bonds for the construction work as contracted for with the Camfield Development Company.

The Colorado Construction Company has recently received from its engineer, Herbert Badger, a complete set of maps for the "Narrows" project on the Platte river. By these plans it is proposed to construct a reservoir at the Narrows and to conduct water through ditches to several smaller supply basins. Land in Morgan, Phillips and Logan counties, aggregating nearly 1,000,000 acres, may be watered by extension of this system. It is claimed that construction work will cost \$11,000,000. One obstacle that must be overcome is the changing of the route of the Union Pacific railroad through Weldon valley.

CALIFORNIA.

The California Irrigated Lands Company has recently purchased 10,000 acres adjoining the Sunset colony, near Gridley.

At the annual meeting of the Azusa Irrigation Company, W. R. Powell was elected president and W. W. Heth, vice-president.

J. S. & W. S. Kuhn of Pittsburg have offered for sale \$2,000,000 in bonds of the Sacramento Valley Irrigation Company. This company controls about 100,000 acres in the Sacramento valley.

At the annual election of the Covina irrigation district the following directors were chosen: A. P. Kerckhoff, J. R. Elliott, J. H. Coolman, E. H. Lehee, J. H. Houser, G. D. Jennings, J. B. Coulson and J. G. Ambrose.

Late in December the Turlock Garden Land Company, with capital stock of \$32,000, was incorporated with headquarters at San Mateo. It is said that the company owns about 6,000 acres under irrigation. E. E. Fitzpatrick is president; E. A. Husing is secretary.

Both ends of East Park dam, Orland irrigation project, are completed to an elevation of 32 feet above the bed of the stream. Between these portions there is a gap through which the ordinary floods will pass. A storm from December 4 to December 8, with its subsequent floods, delayed operations for ten days.

Reports from Los Angeles regarding the Santa Anna Valley Irrigation Company state that it is proposed to revise the by-laws and increase the capital stock from \$100,000 to \$250,000. Land owners in this district will vote upon the proposition. It is proposed to use the additional funds for development work.

By an almost unanimous vote the stockholders of the South San Joaquin district have authorized their directors to issue bonds in the amount of \$1,875,000 for the purpose of reclaiming approximately 70,000 acres. A complete system of reservoirs and canals is to be constructed in the southern end of San Joaquin county.

It is reported that the California Corporation of Sacramento has recently paid \$200,000 for a controlling interest in the Mokelumne Canal Company. This concern holds properties in San Joaquin with about 100 miles of laterals. The project was begun in 1891. H. H. Henderson has, until the present time, owned the majority of stock.

Engineer W. G. Hunter has submitted a report to the board of supervisors at Stockton in regard to the "Bellota Flood Problem." He recommends the construction of a reservoir in Calaveras county for the storage of waters and to control the freshets of the river. This reservoir, accord-

ing to plans, will have a capacity of 80,000 acre feet. Engineer Hunter also recommends investigation of the project for the diversion of Little John creek into the canal of the South San Joaquin irrigation district.

Articles of incorporation for the Sierra Irrigation Company with a capital of \$3,000,000 have been filed at Red Bluff. The principal offices of the company are at San Francisco, but operations will be directed from Red Bluff. The company was first organized as the Valley Irrigation Company, but it was decided to change the name. Several directors of the Antelope Water Company are said to be interested. Incorporators are as follows: H. C. Swain, O. C. Coombs, Alva Dennie, W. L. Bransford, J. J. Wells, all of Red Bluff.

MONTANA.

Farmers in the Tobacco Plains region in Lincoln county are planning for the organization of an irrigation district. Preliminary surveys have been made. It is proposed to construct a system to insure adequate water supply.

Press reports from La Crosse, Wis., state that W. S. Cargill and W. W. Withee, promoters of the irrigation project at Valier, have arranged for a \$3,000,000 bond issue and that a Chicago bonding house has taken the securities.

Lewis W. Hill, president of the Great Northern Railroad Company, is giving his support to the movement requesting the government to abandon its Milk River project in the northern part of the state. Mr. Hill is reported to have declared that the project could be easily financed through a bond issue by a private company. Engineers for the Great Northern Railway are said to have made an exhaustive estimate of cost. Local sentiment is favorable to his plan.

H. N. Savage, chief engineer of the United States Reclamation Service, has filed on water rights on the Flathead reservation for the irrigation of 54,000 acres. This district is in the western part of the state. Much of the water will come from Pend Oreille river and a small amount from Mud creek. After conveying the water through several tunnels it will be raised by turbines to the arable land. It is estimated that the cost of construction work will be between \$2,000,000 and \$3,000,000.

IDAHO.

It is announced that the Salmon River Land & Irrigation Company, having a tract of 5,000 acres in Custer county, has been financed. Spokane capitalists are interested.

The application of the Idaho Irrigation Company for segregation of 9,000 acres under the Carey Act has been approved. Contract figure is \$50 per acre for low land and \$60 per acre for high land. The lands lie sixteen miles southwest of Caldwell.

Owners of land watered by the Owyhee ditch in the Boise-Owyhee project held a meeting recently for the purpose of discussing organization. It is said that sentiment was favorable. Steps will be taken shortly tending to the formation of an irrigation district.

Water users under the Canyon canal near Emmett have decided to organize an irrigation district to take over this canal, which will be completed early in the spring. Officers are: R. B. Wilson, president; H. S. Worthman, vice-president, and V. T. Craig, secretary and treasurer.

It is reported that the Twin Falls-Raft River irrigation project has been financed, and that work will commence on the dam early next spring. The company has a tract of 96,000 acres in southern Idaho, and has headquarters at Rupert. A land drawing will be held before the close of 1910.

Surveyors for the Reclamation Service have been investigating the head waters of the Boise river for the purpose of locating reservoir sites to provide a supply for the Payette-Boise project. Large tracts of land in the headwaters of the river near Centerville have been withdrawn from entry.

The final steps in the organization of the Jump district near Caldwell has been consummated. At a recent

election Charles McCord and C. S. Faurot were elected directors, while there was a tie vote between George Humrickhouse and Charles E. Tabor. Contracts for construction of a canal are now being signed. There are some matters to be adjusted with the Succor Creek land owners, but it is claimed that these will be easily arranged.

At the annual election of the Portneuf-Marsh Valley Irrigation Company at Downey the following officers were elected: D. W. Stanrod, president; Jos. Burns, vice-president and general manager; T. M. Edwards, secretary, and Geo. T. Hyde, treasurer. In addition to these the following directors were chosen: H. O. Harkness, Louis E. Wettling, of Lincoln, Neb., and Paul H. Marley of Mason City, Neb. Work on the canal will be resumed at once.

J. E. Lane has announced that work on the dam across the Snake river above American Falls will be begun within twelve months. This project involves an expenditure of \$20,000,000 and will supply water to 600,000 acres in the Owyhee district north of the Idaho-Nevada line. The Kuhn-Buhl syndicate of Pittsburg is financing the project. By enlargement of the south side canal system to three times the present capacity it is proposed to reclaim a vast acreage. The dam will be 70 feet in height.

NEW MEXICO.

J. E. Eddington, who applied for water-rights on the Penasco river in Eddy county for power purposes has been refused because of failure to comply with the law.

As a result of the controversy over the appropriation of water from the Pecos river, the matter has been carried into the courts at Albuquerque by the Reclamation Service, A. A. Jones and his associates, and the Las Vegas land grant claim rights. Territorial Engineer Sullivan is listening to the testimony.

Territorial Engineer Sullivan has approved the application as presented by J. Turley, civil engineer, for 640 second feet of the San Juan river in San Juan county near the Colorado line. The company represented by Mr. Turley proposes the reclamation of 25,000 acres of valley and mesa lands. Part of the water will be diverted into the main canal for the valley lands and about 40 second feet will be elevated to the mesa lands.

The Portales Irrigation Company has filed articles of incorporation showing capital stock of \$875,000. Land owners representing 10,000 acres have approved the plan of organization. Engineers are now working on plans and specifications. The incorporators and directors are as follows: John A. Fairley, Geo. L. Reece, W. E. Lindsey, Robt. Hicks, Thos. Molinari, S. A. Morrison, Hobson Jones. Mr. Lindsey is president and Mr. Molinari is secretary.

It is reported that the final survey on the line of the Eden canal near Aztec has been completed and that actual construction of this high line canal will be begun within a few weeks. The ditch will be about 40 miles in length and will reclaim 40,000 acres on the east side of the Animas river and nearly 80,000 acres on the west side of this river where the line runs into the La Plata valley. W. G. Black of Aztec is reported to have interested Denver and New York capitalists and to have arranged the finances. Water costs are estimated at \$40 per acre.

Business men and land owners near Melrose are interested in a proposition for the construction of a \$450,000 irrigation plant. Mr. L. Y. Fuller recently submitted a proposition whereby he would insure the construction of this plant providing farmers contracted for water at a specified rate. While there are nearly 100,000 acres available for irrigation it is claimed that about 15,000 acres have already been pledged. It is proposed to construct a plant with three 500-K. W. generators and three 750-H. P. engines to pump the water. There is great interest in this project and it is claimed that farmers in nearby districts are planning organizations for similar purposes.

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OREGON.

A company which was formed near La Grand, Union county, within the past year is now building canals for irrigation purposes, and is about to close a contract for the construction of a dam at Meadow Brook. This will store water to supply 35,000 acres in Grande Ronde valley.

At a special meeting of the stockholders of the Owyhee Ditch Company to consider the proposition of joining the Malheur irrigation district, a resolution was adopted agreeing to join the district provided the Owyhee settlers' prior rights were recognized in case of shortage of water. Similar action was taken by the stockholders of the Nevada Ditch Company at a meeting held recently.

Engineers employed by settlers in Crook county have recently completed surveys for a reservoir at Crescent Lake on the Upper Deschutes river. Application for rights has been submitted to the Secretary of the Interior, Crescent Lake being located in the national forest reserve.

James John, president of the Hartman Prospect Company of Pendleton, is of the opinion that by proper construction work many thousands of acres of land may be irrigated by waters from McKay and Birch creeks. He proposes to interest the commercial association in the formation of an irrigation company.

A company known as the Fall River Irrigation Company is planning the reclamation of 2,000 acres near Bend. Land owners are stockholders. The following are interested: M. J. Main, John Usher, A. D. Lewis, John Peters, Joe Hoffman, Bob Bowser and Harold Palmer. The main canal will be about six miles long.

Early next spring the Powder Valley Irrigation Company will begin work on two reservoirs in the Powder River valley, seven miles east of North Powder, and twenty miles north of Baker City. The company proposes another reservoir about thirty miles northeast of Baker City. The system will irrigate 65,000 acres on both sides of the Powder river.

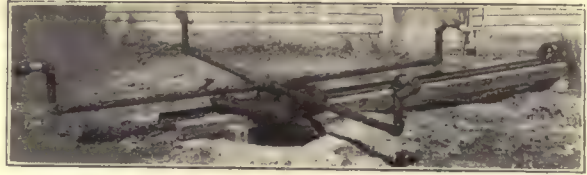
The Western Umatilla Water Users' Association has been incorporated with capital stock of \$10,000. The company is composed of settlers with holdings under the Western Land & Irrigation Company's project. Directors are: C. D. Teal, president; R. C. Canfield, vice-president; J. W. Campbell, secretary, and Thomas Hurlburt, treasurer. About 10,000 acres, west of the Umatilla river are represented in this organization.

In financial circles it is reported that the Deschutes Irrigation & Power Company will be unable to float a new bond issue as originally proposed. By payment of bond interest a foreclosure is avoided, but it is said that the company will be reorganized as outlined several months ago. In a recent announcement sent to stockholders by the secretary it was stated that new officers would be elected at the January meeting.

The Oregon, Washington and Idaho Finance Company, which has recently taken over the Columbia Southern Irrigation Company, has secured signatures to contracts and will complete the original project. A dam will be constructed to store waters for about 45,000 acres. Officers of the company are as follows: President, Otis H. Wright; secretary, A. D. Katz; vice-president and treasurer, H. B. Steel of Van Couver, Washington.

Pending litigation over the title to the grant lands of the Dallas Military Wagon Road Company the Eastern Oregon Land Company is planning the development of water power on the Deschutes. Test points are now being sunk and it is proposed to construct a dam more than 1,000 feet in length to raise the water of the river 140 feet. Balfour, Guthrey & Co., are fiscal agents, and Whistler & Stubblefield are engineers in charge of preliminary work.

W. H. Bradford, E. C. Belknap and Chas. H. Glein have filed articles of incorporation at Portland for the Warner Lake Irrigation Company. Under its plan the company proposes reclamation work in Warner Valley, Lake and Harney counties, to cost \$250,000. The company also proposes to operate electric railways and develop electricity for power purposes. Offices will be at Portland. About 97,000 acres are available for irrigation in this district.



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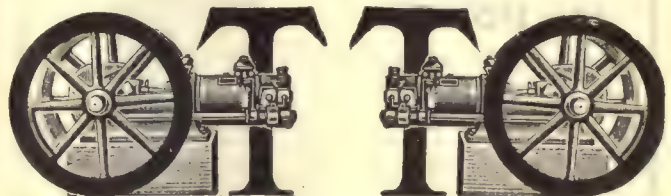
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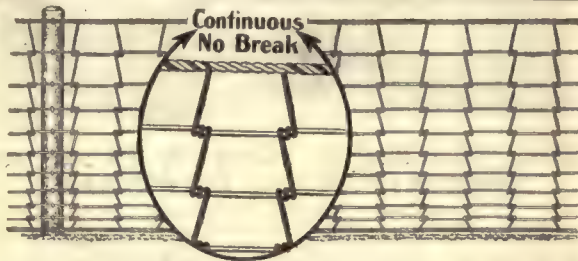


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UTAH

At the election of the Oneida Irrigation District corporation Jas. G. Taylor and S. J. Callan were elected directors.

Attorney Geo. W. Bartch has secured a judgment against the Millard Land and Irrigation Company for \$1,000.50 as attorney's fees and one thousand shares of the capital stock.

Stockholders in the Blue Cliff Canal Company are considering the advisability of a consolidation with the Provo Reservoir Company at Provo. The majority of the stockholders are said to favor the plan.

The Hatchtown State Reservoir project in Garfield county is nearing completion and it is reported that water will be supplied for the 1910 season. Funds for this project were taken from the Reservoir Land Grant and as the land is sold the money is returned to the State.

Litigation between the city of Salt Lake and the East Jordan Canal and Irrigation Company is now pending before Judge M. L. Ritchey. The city attempts to condemn a right of way through the East Jordan canal. The irrigation company is fighting to prevent condemnation.

The Pneumatic Water Lift Company, formed for the purpose of exploiting an apparatus for the elevation of water, has filed articles of incorporation at Ogden. Capital stock is placed at \$100,000. E. G. McGrif is president and C. D. Ives, secretary and treasurer.

J. Lauritzen of Richfield is promoting a project to reclaim land in that vicinity by storing waters of the Virgin river. He is said to have interested Chicago capitalists. Another project for the reclamation of 50,000 acres with water from the Virgin river has been pronounced feasible by engineers and it is claimed that promoters are now trying to secure funds.

The Pacific Land and Water company has filed articles of incorporation with capital stock at \$300,000. It is proposed to reclaim 40,000 acres in the northwestern part of Utah, and the southern part of Idaho. This district is commonly known as the Emery tract in Box Elder county. Following are the officers: James H. Patterson, president; Robert A. Lafount, vice-president; C. N. Strevell, secretary; F. A. Druell, treasurer, and Harold A. Lafount of Logan, general manager. The active management of the company will be with Mr. Lafount at Logan.

Utah capital is interested in a \$3,000,000 project known as the Truckee-California Irrigation Company for the reclamation of an immense tract of land in Nevada. O. B. Bergland of Gunnison is president and W. G. Tollestrup of Salt Lake City is secretary. It is planned to tap Independence lake not far from Floriston, Nevada, and carry the water down Independence creek to be stored at the Junction of the latter stream with the Little Truckee river from whence it will be sent through a canal to a distribution point near White Lake. Lands to be reclaimed are in the vicinity of Reno. Plans for construction call for a 6,000-ft. tunnel.

WASHINGTON.

The Lower Yakima Irrigation Company of Richmond has added 100 acres of land to its project. Two new pumping plants will be installed.

It is announced that the Post Falls irrigation project will be completed by June first of this year. The total cost of the work is estimated at \$1,000,000.

The Okanogan Irrigation & Improvement Company proposes to begin active work on its high line ditch in the spring. The project will irrigate 14,000 acres.

C. P. Devine has filed on the waters of Winas creek and proposes to carry a supply through a ten mile system of canals to irrigate a large tract of land.

The irrigation company at Kennewich has secured an additional 2,000 acres which it proposes to irrigate by pumping. New machinery will be installed in the plant.

Spokane men are said to have purchased 900 acres in the vicinity of Hell Gate with the intention of installing a pumping plant for irrigation. The capital of the new company is \$50,000.

A. M. Ham has instituted suit against the Grapeland Irrigation district for \$12,105 alleged to be due as principal and interest on the district's bond issue in 1887 under the Wright Act.

The Plause Irrigation & Power Company is said to be considering the advisability of reviving the Palouse irrigation project. Extensive surveys for this project have been made at various times.

The Quincy Valley Water Users Association in which owners of 2,000 acres of land in Grant County near Quincy and Ephreta are interested has recently filed on the waters of Pend Oreille river near Newport, 46 miles north of Spokane. Cost of the work is estimated at \$20,000,000.

The Hanford Irrigation & Power Company, from its headquarters at the foot of Priest Rapids on the Columbia river, is planning for extensive construction work early in the spring. The work involves the expenditure of \$1,000,000 and the building of a high line ditch to irrigate 15,000 acres in the valley west of White Bluffs.

Kilbourne and Clarke of Seattle have been awarded the contract for construction of a pumping plant for the Columbia River Orchard company near Wahluke. The contract calls for an electrically driven plant with a capacity of 40,000 gallons per minute. This supply is believed to be adequate for the irrigation of a 10,000 acre tract.

W. S. Gamble is authority for the statement that the cost of the proposed tunnel under the Cascade canal about five miles west of Ellensburg will not exceed \$300,000. This estimate is based on the report submitted by Engineer Harry Riddell. Stockholders of the canal company are seriously considering the advisability of this construction work. A proposition for the improvement of the present canals is also before the board of directors.

Owners of 50,000 acres in the vicinity of North Yakima are planning to petition Secretary Ballinger for permission to levy an assessment of \$1.00 per acre to construct a high line canal. The proposed ditch would be an extension of the one already begun in Kittitas county and would be brought down through the hills to Selah valley and thence through the Moxee valley to the Sunnyside canal. Storage dams may be constructed at Lakes Katches and Kitchles.

Canal construction on the Tieton unit of the Yakima project will be sufficiently advanced during the irrigation season of 1910 to allow the furnishing of flood water to approximately 10,000 acres in Yakima county. The secretary of the interior has granted authority to furnish this flood water on a water rental basis in the irrigation season of 1910, at the rate of \$1.50 per acre for the season to those water users within the first unit of the Tieton project who make application for such service before March 1, 1910.

The secretary of the interior has formally approved a plan whereby the Reclamation Service may undertake to furnish water to about 2,200 acres of land in the vicinity of Prosser, during the season of 1911. The conditions to be complied with in general are as follows:

1. That the building charge for lands which have a water right from the Prosser Falls Land and Power company as shown by the abstract of title and reports of the company which have been submitted to the office of the Reclamation Service at North Yakima, be fixed at \$31 per acre; that the building charge to lands without water right be fixed at \$52 per acre, the same as for other lands in the Sunnyside project, and that the operation and maintenance charges for all such lands be the same as fixed from time to time for other lands in the Sunnyside project.

2. That before construction is authorized at least 90 per cent of the lands having a Prosser Falls Land and Power Company's water right, and 90 per cent of the lands having no such water right, or a total amount of land which will give an equivalent return in money on the basis of such building charges, must be subscribed for in the Sunnyside Water Users' Association, and the town of Prosser must enter into a proper contract with the United States for the supplying of the town with water for irrigation purposes subject to the stipulation that should the town secure the release to the United States of $2\frac{1}{2}$ cubic feet of water per second, being part of the five cubic feet of water per second held by the Prosser Falls Land and Power Company for irrigation purposes, the town of Prosser will receive a credit on account of the charges under such contract to the extent of \$2,900.

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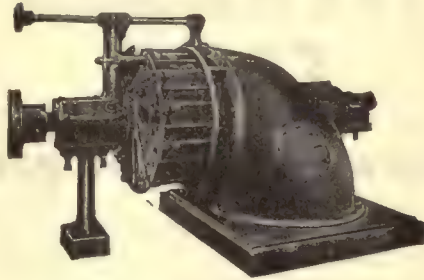
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3. A relinquishment to the United States of 25 cubic feet of water per second by the Prosser Falls Land and Power Company free of all liens, conditions or charges of any kind.

4. The securing without cost to the United States of all necessary right of way for pipe lines, canals and incidental structures for the works necessary for carrying out this agreement.

The secretary directs the Reclamation Service that when these conditions are satisfactorily fulfilled construction of the works necessary to irrigate the Prosser lands may be undertaken, and that such construction shall be taken up in advance of the commencement of work for any pumping plants for the Sunnyside project.

WYOMING.

It is announced that Wm. Farson of Farson, Son & Company of Chicago, has been elected president of the Eden Irrigation & Land Company of Rock Springs.

Representatives of the North Platte Valley Irrigation Company announce that arrangements have been made to secure \$2,000,000 for construction work. This company owns the present La Prele irrigation system and under its project about 100,000 acres will be watered. The company also proposes to develop water power. Officers are as follows: J. P. Wilson, president; W. F. Hamilton, vice-president, and W. J. Lester, general manager.

Land owners in the Parkman irrigation district were called upon to vote on an issue of \$150,000 bonds for construction of a system of reservoirs and canals. It is claimed that the supply will be adequate to irrigate 14,000 acres in Sheridan county. It is proposed to utilize the old Granger ditch. Preliminary surveys have been completed. Officers of this district are as follows: President, I. McNutt; secretary, W. H. Wallace. Water will be taken from the Tongue river at a point west of Sheridan. A siphon will be necessary to carry the waters over Fool creek.

Thomas B. Lentry, acting as attorney for Gist Brothers, La Plata county, Missouri, contractors, filed suit recently at Chicago against the Wyoming Land and Irrigation Company of that city in the municipal court asking \$100,000 for breach of contract. The suit involves a ditch dug for the irrigation company at Basin, Wyo.

On January 1st the government's Shoshone dam was completed to within seven feet of the finished structure, only about 600 cubic yards of masonry remaining to be laid. Forty-five feet were added to the height of the dam during December in spite of the difficulties incident to the severe winter weather.

MISCELLANEOUS.

The Mississippi Land Improvement Company of Brownsville, Texas, will increase its irrigation capacity by the construction of dams. About 9,000 additional acres will be brought under water.

Reports from the Southern Alberta Land Company operating near Medicine Hat, Alberta, Canada, state that before suspension of work the first division of the project had been about two-thirds completed.

Preliminary surveys for its system of reservoirs and canals have been completed by the Gravity Irrigation Company of Hidalgo county, Texas. Active work will be begun within the next few weeks.

Land owners on both sides of the California-Nevada state line are fighting over the right to waters of the Walker river. For several years this controversy has been before the courts in various forms.

Land owners in the Sulphur Springs Valley near Tucson, Arizona, are experimenting with irrigation by pumping. It is claimed that these experiments have been successful and that many wells will be sunk during the coming season to provide against the annual mid-summer drought.

The total amount of masonry laid in the government's Roosevelt dam, Salt River irrigation project, Arizona, up to the first of January was 295,338 cubic yards, leaving

31,000 cubic yards yet to be laid. During the season of 1909 water was sold for 74,256 acres, the receipts being \$70,126.25.

The Chamber of Commerce at Globe, Ariz., is interesting itself in the San Carlos irrigation project. It is proposed to assist in organizing a company for construction work.

The Louisiana Irrigation & Milling Company at its annual meeting recently ratified the action of its board of directors in adopting a cash basis for water rentals to be effective early next spring. It is believed that the decrease in the canal acreage will not be more than thirty-three per cent.

Experiments are now being made along the White Creek near Laoti, Kansas, to determine whether or not water for irrigation purposes can be secured from deep wells. Owing to the rigorous weather these experiments have been temporarily abandoned but it is predicted that they will be taken up again early in the spring.

Work on the Yuma irrigation project, California-Arizona, during the past month has been confined principally to canal excavation. About 150 men with two steam shovels were engaged on the reservation, and 50 men with 100 head of stock were engaged on scraper work. About 18,500 cubic yards were moved with the shovels.

Land owners in the Pecos Valley were called to conference at Pecos, Texas, on January 26th to discuss methods of organization and co-operation in the conservation, distribution and diversion of waters available for irrigation. Many matters of importance to organized districts were discussed. Reports told of various pumping systems now in existence and indicated the plans of operation thereof.

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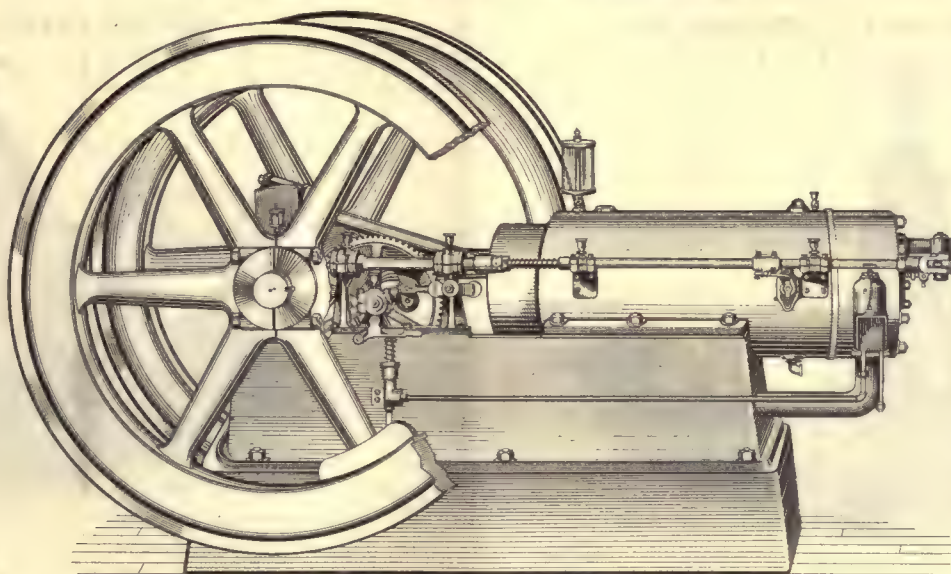
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Books on Irrigation and Drainage

The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
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Practical Design of Irrigation Works, W. G. Bligh	6.00
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Earth Slopes, Retaining Walls and Dams, Chas.	
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Drainage for Profit and Health, Waring.....	1.00
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Land Drainage, Miles.....	1.00
Tile Drainage, Chamberlain.....	.40
Cement Pipe & Tile, Hanson.....	1.00

The Irrigation Age Company,

112 Dearborn St., Chicago, Ill.

The Vegas artesian water syndicate of Vegas, Nev., has recently interested Judge Kenneth M. Jackson, and it is proposed to sink artesian wells for irrigation purposes. About 28,000 acres are now under control of the company.

Work is now progressing on the irrigation system in the vicinity of Lake Wichita, Texas, to water lands in the vicinity of Wichita Falls. Frank Kell, J. A. Kemp and T. R. Orth are backing the proposition. About twelve miles of ditch will be constructed.

Plans to irrigate 24,000 acres in the Rio Grande valley have been completed by the Texas-Louisiana Sugar Company of Texas, a recently organized concern. About \$200,000 will be expended on the irrigation system located between San Juan and McAllen.

Directors of the United States Rice & Milling Company of Crowley, La., have arranged to extend the company's canals in Vermillion and Arcadia parishes for a distance of about twenty-five miles. Work will be begun at once. Storage increased by the construction work will water 10,000 acres.

Recently there has been formed the Arkansas Valley Irrigation Company of Colorado, with capitalization of \$400,000, for the purpose of reclaiming lands in Ford, Gray and Edwards counties, Kansas. The company will revive the Eureka irrigation ditch, commonly known as the Soule ditch. John T. Barnett of Denver, A. M. Eppstein of Denver, T. A. Scates and Albert Watkins of Dodge City and J. W. Gilbert of Spearville are incorporators.

Assistant State Engineer Ralph D. Goodrich has tendered his resignation to State Engineer Clarence T. Johnston, of Wyoming, and will be succeeded by J. F. Kingston of Casper. Mr. Goodrich has accepted the position of chief engineer for the company which is constructing the Oregon Basin project in northern Wyoming. This project is the largest ever undertaken in the state and will reclaim 300,000 acres of land with water from the Shoshone river.

THE GOULD COMPANY

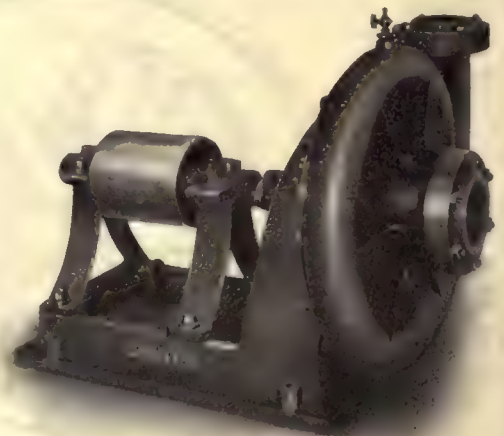
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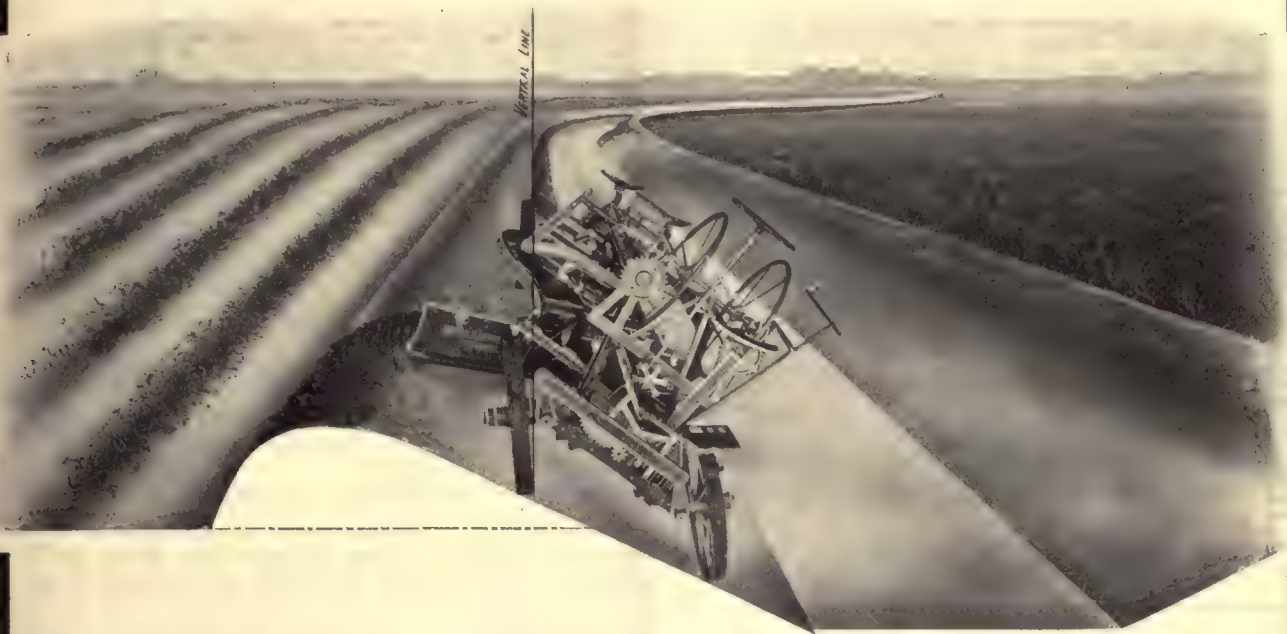
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This type of machine is different from all other ditching machinery, in that it plows the dirt out of the ditch with a continuous sweeping motion, whereas all other machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The cost therefore, per cubic yard, of excavating with the U. S. Reclamation Ditcher is necessarily much less than with any other tools or appliances.

The Reclamation Ditcher is adapted to cutting ditches as deep as three feet below the original surface and as wide as ten feet at the bottom and with sides sloped as steep as 2 to 1.

It has adjustable oblique wheels which perform the same function as the oblique wheels of a sulky plow. They are simply rolling landsides which counteract the side pressure of the earth on the mold and also make it possible for the machine to be operated on the sloping side of the ditch as shown in the cut.

It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

The difference in cost of cutting ditches with the Reclamation Ditcher and any other form of machinery is sufficient to pay for the machine very quickly. We absolutely guarantee this and will prove it to you by a demonstration of the machine on your own work before you accept it.

Write for descriptive folder which gives diagrams of ditches and cost estimates.

J. D. ADAMS & CO., Indianapolis, Indiana

FARMS ON LAKE BEDS.

Clear Lake dam, another large structure of the Government is now practically completed. This dam is located on Lost River at the outlet of Clear Lake, in Modoc County, California. Its purpose is to form a reservoir for impounding water for use in connection with the Klamath irrigation project, Oregon-California. Excavation at the outlet was begun during the fall of 1908, and actual construction of the dam itself was begun in June, 1909.

The dam is of the earth and rock-fill type, with concrete outlet works and spillway. Its extreme length is approximately 940 feet, and its extreme height 33 feet. The reservoir has a surface area of approximately 25,000 acres, and a capacity of 1,089,000,000 cubic feet.

The Klamath project involves perhaps the most unique engineering works yet undertaken by the Government. A considerable portion of the lands to be irrigated are now covered with the waters of navigable lakes. This water is to be drawn off and the lake beds turned into agricultural fields. When completed the project will embrace nearly 200,000 acres of land.

TRUMP TURBINES.

Representatives of the Trump Manufacturing Company, makers of water power machinery, at Springfield, Ohio, state that there is heavy inquiry for the company's turbines for driving centrifugal pumps for irrigation plants. Within the past few weeks the company has sold to the King Hill Irrigation Company, of King Hill, Idaho, to W. B. Slick, of Bliss, Idaho, and several other irrigation enterprises throughout the west.

Among the other recent sales of Trump turbines are the following:

High Falls Power Company, Halleybury, Ont., two high head special horizontal turbines designed to work under a head of eighty-five feet, direct connected to generators. These wheels will generate power to be furnished the gold mining properties in the Cobalt district.

Basic City, Va., for municipal hydro-electric plant. This shipment consisted of two pair of horizontal Trump turbines of draft chest type driving direct-connected generators. This plant will furnish the city with light and power.

C. Miller & Son, of Clermont, Iowa, have secured a franchise from their city to furnish same with electric light and power. Trump turbines will be used in this plant and it will be noted that this is the third important hydro-electric development in which Trump turbines have been used in the state of Iowa, during the past few months.

Send \$2.50 for the Irrigation Age 1 year, and a cloth bound copy of the Primer of Irrigation.

GREAT TRANSFORMATION.

The great importance and benefit of the present agitation on the subject of irrigation is seen not only in its opening up of territory which has heretofore been uninhabited and entirely unproductive, but in its renovating and practically working over of the oldest communities in the United States.

Such a condition we find at Santa Fe, New Mexico, which claims the distinction of being the oldest city in America, with the first buildings, both churches and residences, that were ever built on the American continent. Irrigation has been practiced in this vicinity for centuries, but only in a primitive way. The tourist of the present day will find Santa Fe transformed into a modern, up-to-date city with magnificent residences and public buildings, a splendid public school system and quite a number of important private educational institutions, and a goodly supply of churches, both Protestant and Catholic. Banking and commercial houses are conducted along up-to-date and approved lines, where the traveler and homeseeker can find the most modern accommodations along these lines.

As one of the strongest evidences of the awakening of the Santa Fe District we find a modern, up-to-date irrigation project, well under way, a few miles from the city on a mountain stream known as the Arroyo Hondo. This project is being exploited by the Santa Fe Irrigation and Improvement Company, and is backed by men of ability and of sufficient means to carry out the undertaking. It is the express purpose of this undertaking to irrigate a tract of about 10,000 acres of land beginning about four miles from the city.

A little trip among the gardens and orchards of Santa Fe and surrounding country, where fruit growing and gardening has been practiced for upwards of three hundred years, we find some results that are astonishing to those who are not posted on this territory. We find beans averaging 2,000 pounds to the acre, currants netting \$500 per acre, wheat running 50 bushels to the acre, oats 80 bushels to the acre, tomatoes producing \$700 per acre, potatoes averaging 300 bushels to the acre, alfalfa from four to five tons per acre and worth from \$12 to \$18 per ton, celery bringing as high as \$1,600 per acre, Spanish onions 80,000 pounds to the acre, worth from 3c to 4c per pound, cabbage 50,000 pounds to the acre. It is possible to find cabbage heads weighing 80 pounds or more raised in this neighborhood. Apples from \$500 per acre up. Other fruits are raised successfully, such as pears, peaches, prunes, grapes, nectarines, etc.

Apparently very satisfactory conditions face the man who wishes to settle in the Santa Fe District. One of the strongest attractions, of course, is its climate, which the government reports indicate to be the finest on the American continent.

ENGINEER HAYS LEAVES SERVICE.

In the resignation of Mr. David W. Hayes, employed on the Truckee-Carson irrigation project, Nevada, the Reclamation Service has lost one of its most efficient engineers. Mr. Hays received his education in the Nevada State University. In 1900 he was levelman and topographer under the Commissioner of State Highways of the State of California, in survey of road into Yosemite Valley, and in survey of the Placerville road between Placerville and Lake Tahoe. In 1901-02 he was assistant hydrographer and engineer in stream measurement and surveys of canals and reservoirs under L. H. Taylor, U. S. Geological Survey. On January 1, 1903, he was appointed assistant engineer in the U. S. Reclamation Service. Mr. Hays will engage in private practice of his profession with headquarters at Reno, Nevada.



From 600 trees Miss Cowperthwaite harvested 450 boxes summer and fall apples; 3,000 boxes of winter varieties, which sold for \$1.35 per box, making a grand total of \$4,657.50. Photo taken October 9, 1909, Santa Fe District.

Land Opportunity in the Santa Fe District

Get your share of the profits on the present day high-cost of living.

Prices on food stuff are governed by the law of supply and demand.

Secure a 20-acre tract in the Santa Fe District and be a producer, and at the same time reduce your own expenses.

This land all within a short drive of New Mexico's beautifully situated capital city.

Proven by government statistics to be the finest climate in the world.

Two town sites on the land and two railroads crossing it. Every tract within three miles of a town site.

A former governor of New Mexico says: "THE SANTA FE DISTRICT HAS MORE ADVANTAGES AND FEWER DRAWBACKS THAN ANY IRRIGATED SECTION IN AMERICA."

Send or call for full particulars.

National Mortgage and Bond Company

134 Monroe St., Chicago, Ill.

(Continued from page 156.)

upon the surface. The corn came up in four days and grew strong and vigorous. The soil was plowed deep about every ten days, fully turned over and followed with the cultivator and harrow, until it became so soft and powdery that it was difficult to walk in it. It was also hoed frequently, not a weed being permitted to appear, and the soil stirred deep and drawn well up over the roots. The land measured about an acre. The corn grew to full maturity without a single set back, or twisting of a leaf. The stalks measured an average of nine feet and each bore from two to four perfect ears of plump kernels, and made good roasting ears, and when harvested in the middle of June, the ground still showed some moisture.

Instances of this particular kind are abundant in every locality in the arid and semi-arid regions. They are nothing but experiments, or rather accidents, and prove nothing that can be of general utility. They show, however, what may be done by careful cultivation with a small amount of water husbanded to the last drop. There was not a particle of alkali in the soil above referred to, and it was very retentive of moisture. It emphasizes what the author contends, and what scientific investigation places beyond the pale of denial, that cultivation and moisture are what may be considered essentials, and not water in its liquid form. To borrow a word from another profession: we are dealing with the homœopathy of agriculture, and advocating water triturations provided they accomplish the purpose of growing a profitable crop, where drastic doses will ruin.

In every case, however, the supply of water diminished by evaporation must be restored either by irrigation or by rain fall, and the requisite amount must be continuous and not intermittent; that is, the plant must be kept growing.

If it were not for the fact that water is a solvent of the salts necessary to plant life, and as a medium for conveying them in a state of solution to the plants, there would be no necessity for water, and plants could grow in an absolutely dry and rainless region without irrigation.

It should be borne in mind that it is not so much "wetness" that plants require, as a medium for dissolving the

earthy salts and vegetable acids, so that the two may find their affinities and form the various chemical combinations which are necessary to make the plant. When that has been accomplished all the rest is surplus, waste, useless expenditure of the forces of nature, deleterious to plants by over feeding them, and injurious to the soil by washing its reserve elements out altogether, or driving them down into the subsoil beyond the reach of the plant roots, or forcing them to combine in excessive quantities which leach out, or crystallize on the surface and accumulate in masses that prevent the germination of seeds.

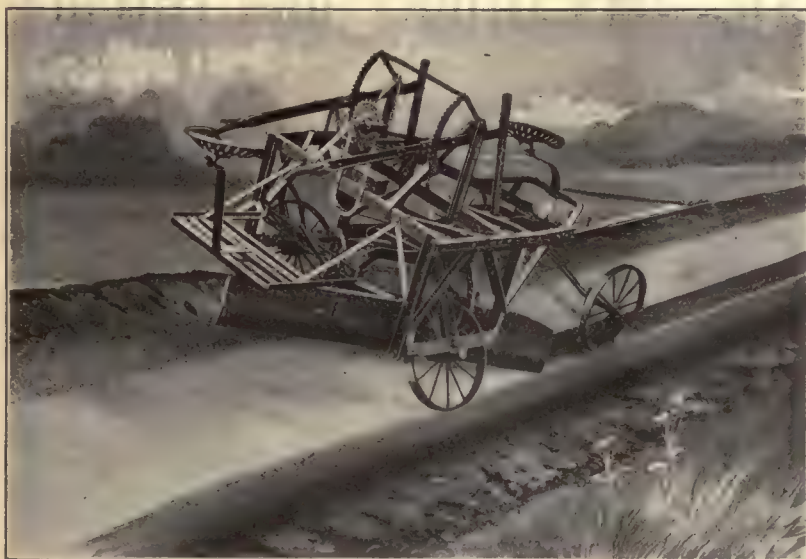
More will be said upon this important subject in the chapter on "The Relations of Water to the Soil," the second bane of desert land, "alkali," being next in order.

(Continued from page 168.)

stantially increase the amount of water therein," or prevent the decrease thereof by natural causes. Defendant's canal was the only source of water supply for an arid valley some 30 miles long and containing 20,000 people, who were wholly dependent thereon for water for domestic purposes and the raising of crops. It appeared that in order to supply their needs, and especially to meet emergencies, as in case of hot winds to which the valley was subject, it was necessary to run through the canal, which was 61 miles long, a quantity of water somewhat in excess of the average consumption, and that the excess, when unused, was discharged through waste gates and flowed into the lake at a point some 40 miles from complainant's land, but not in such quantity as to materially affect its volume. Held that, giving the decree a proper and reasonable construction, such waste of water into the lake did not work substantial injury to complainant, and was not a violation of the injunction.—*The Salton Sea Cases*.—*New Liverpool Salt Co. v. California Development Co.* U. S. Circuit Court of Appeals. 172 Federal 820.

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The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling land-sides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

EVERY IRRIGATED RANCH OR FARM NEEDS ONE OR MORE OF THESE MACHINES. IT WILL QUICKLY PAY FOR ITSELF. SEND FOR DESCRIPTIVE FOLDER AND LET US TELL YOU MORE ABOUT IT

J. D. ADAMS & COMPANY, INDIANAPOLIS, INDIANA

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(Continued from page 160.)

stand what varieties to plant and how to organize most effectively the means to market their project, so that the best money returns will follow.

Fourth. The valley has the best kind of natural protection from frost. It is surrounded by hills on three sides and is narrow, being from one to five miles wide.

Fifth. The transportation problem is solved and any farm can not be more than two miles from the railroad or more than 3 or 4 miles from a shipping point. The valley is 400 miles nearer the Eastern market than some of the well known fruit raising districts that have become famous in Washington. It is about twenty-five miles west of the famous Payette district in Idaho. This altitude is ideal, being 2,300 feet. This assures a nice climate both in summer and in winter.

Seventh. The soil is a deep volcanic without hard pan or alkali. Drainage, which means so much to a fruit district, is perfect.

Eighth. Many of the settlers who arrived early enough in the Spring of 1909 turned part of their attention to crop raising and some great yields were reported. Actual returns on alfalfa netted the ranchmen from \$50 to \$110 per acre. Several reported potato crops to net them \$250 per acre. Reports of oats yielded 110 bushel per acre, barley of 60 bushel per acre and wheat of from 40 to 65 bushel per acre, are common in the county. All of this shows that outside of the great fruit proposition, this locality is a gold mine to the men who desire to follow agricultural pursuits or to those wishing to plant between the trees while waiting for the orchards to mature.

The dairy and poultry business are both profitable here. The man who enjoys a day's sport with guns and rod can find no better place than Malheur County and the country tributary thereto. While swan, brant and duck are very plentiful here, also we find sagehen and quail all over the country. The streams are filled with trout and other fish. Plenty of bear, deer and larger game are found in the mountains nearby.

The Willow River land is on the Eastern edge of Oregon. To get to it, get off at Ontario and the main

line of the Oregon Short Line and take the branch road that runs from there to Vale, a distance of 20 miles. The Willow River Railroad extension will begin at Vale and run straight up the valley. Ontario a prosperous town of 1,800, has the finest depot on the Short Line in the center of a district where large quantities of fruit are raised as well as all the varieties of farm produce.

The land from Ontario to Vale is under irrigation as far as it has been possible to cover it with water taken from the Malheur River. There are beautiful farms which show prosperity on both sides of the railroad track. Dry farming is pursued at the head of the Willow River Valley.

Vale is a town of about 1,500 inhabitants and has a first-class modern hotel, two banks with nearly a million deposits, and fine substantial brick buildings. As it is the nearest railroad point to a great district to the West, it is of much importance.

GOVERNMENT CONTRACTS.

The Secretary of the Interior has awarded the following contracts in connection with the Government irrigation projects:

To the Atlas Portland Cement Company for the delivery of 14,000 barrels of cement f.o.b. cars at Hannibal, Missouri, for the Belle Fourche project, South Dakota, and the Strawberry Valley project, Utah, at 80 cents per barrel.

To the Colorado Portland Cement Company, Portland, Colorado, for 15,000 barrels for the Uncompahgre Valley project, Colorado, at \$1.15 per barrel.

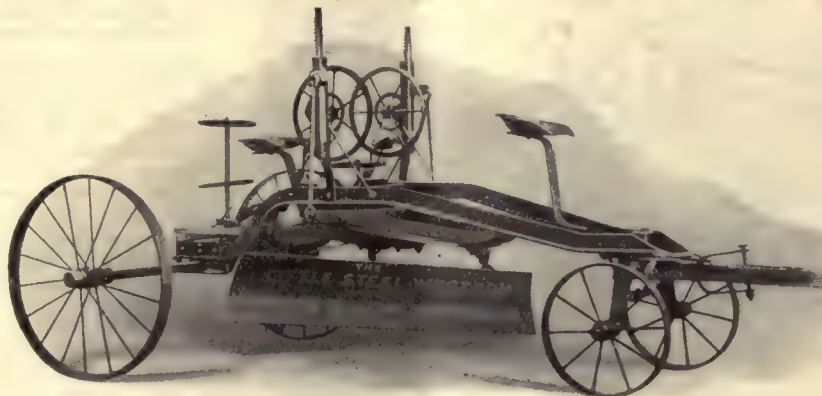
To the Marquette Cement Manufacturing Company of LaSalle, Illinois, for 6,000 barrels for the northern district, exclusive of the Blackfeet project, at 85 cents per barrel.

S. Morgan Smith Company of York, Pennsylvania, for the installation of an exciter water wheel in the power house of the Salt River irrigation project, Arizona. The contract price is \$1,740.

The Little Western Steel Grader and Ditcher

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WILL**

Grade Roads
Make Ditches
Cut Laterals
Save Money



**IT
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Break
Get Out
of Order
Tire the
Horses
Prove
Expensive

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"GENERAL PURPOSE" Grader and Ditcher Built

TRY ONE AT OUR EXPENSE

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OR
4
HORSES

Also Excavators, Heavy Graders, Wheelers, Drags, Plows, Etc.

THE AUSTIN-WESTERN CO., Ltd., Dept. I, CHICAGO

1
OR
2
MEN

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(Continued from page 164.)

usually follows some other crop. If preceded by grain the stubble is first pastured, preferably by sheep, plowed in the fall to a depth of 7 to 10 inches, and then allowed to lie until the following spring, when it is disked, harrowed, and seeded.

Experience has shown that it is difficult in the course of six months or a year to secure a good stand of alfalfa on raw land that has been covered by a desert growth. This is true particularly of rough, uneven land on which crop rotation is not to be practiced. It is likewise true of land thickly covered with brush. It has been found impracticable in most localities to secure a smooth, well-graded surface where fresh roots interfere with the proper use of all grading and leveling implements. The same is true of hog-wallow land, where considerable soil has to be removed from the high places and deposited in the low places. It takes time and a second preparation of the surface before fields of this character can be put in good condition for the growth and irrigation of alfalfa. If crop rotation is to be followed the necessity for a preparatory crop is not so urgent, since the alfalfa will soon be plowed under to give place to another crop. In northern Colorado, where alfalfa usually follows either potatoes or sugar beets, the surface is not plowed, but merely harrowed or disked in the spring just before seeding. If the surface is uneven, it is smoothed and leveled by means of a float or drag before the seed is put in. In southwestern Kansas it is likewise considered best to plant alfalfa after some cultivated crop which has held the weeds in check. The land is plowed in the fall to a depth of 6 inches, double-disked in the spring after the weeds have started, and is subsequently harrowed. In the vicinity of Los Banos, Cal., new land is almost invariably sown to barley or corn for two seasons before seeding to alfalfa. In Utah wheat or oats is preferred as a preparatory crop. The chief purpose of all such preparatory grain crops is to allow fresh roots of the original plant covering to decay, filled-in spots to settle, high places denuded of the upper layer of soil to weather, and in general to prepare a well-pulverized seed bed in a smooth, well-graded field.

(Continued from page 158.)

CORRECTIONS OF STATEMENTS IN SECOND PAPER (JANUARY ISSUE).

Utah State Board Land Commissioners.

W. H. Farnsworth, secretary; vice, Thos. C. Callister. **South Dakota.**—Carey Land Act Board, principal official, Samuel H. Lea, state engineer.

Rights of Married Women to File.

Idaho.—Not permitted to file.

Wyoming.—Permitted to file.

Colorado.—Question not decided.

Utah.—Permitted to file.

Montana.—(Correction of typographical error.)—Permitted to file if the head of the family, through physical incapacity, or incarceration for crime of the husband.

Oregon.—Permitted to file.

New Mexico and South Dakota.—No data.

It is well to remember that married women, to file, must be citizens of the United States and that entries must be made (as to time and place) in a manner permitting acceptable final proof in case husband and wife both make entry, as husband and wife must reside together, to perform legal residence.

SEEDS.

Every farmer will be interested in the new seed catalogue just issued by R. H. Shumway, Rockford, Illinois. It contains hundreds of beautiful illustrations and is a perfect mine of information on all kinds of garden and flower seeds. Mr. Shumway has built up an immense business by giving every customer a fair deal and selling good seeds cheap. Send for his catalogue today.

Send \$2.50 for The Irrigation Age 1 year, and cloth bound copy of the Primer of Irrigation

Do Your Farming
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HART-PARR GAS TRACTOR

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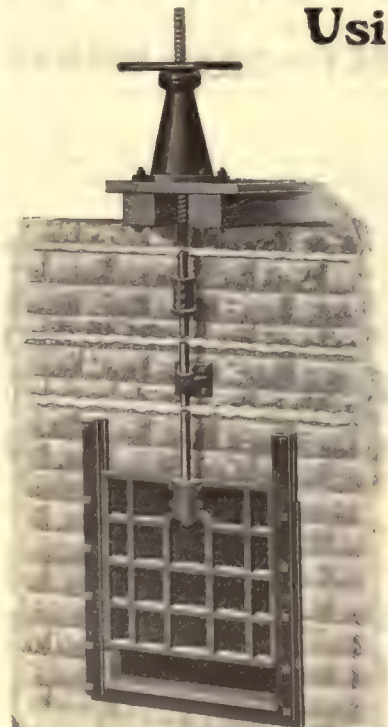
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When we drive home from the implement dealer with our little load of Sisal twine for the coming harvest, we do not often realize that we are giving that twine its final lift on the journey of many thousands miles which it has taken months to make. Seldom do we appreciate when we give it its final resting place in the binder box that the first hands which touched it were those of a Maya boy or girl in far off tropical Yucatan whose ancestors were a great civilized people, with temples and literature, centuries before Columbus came ashore in his red velvet suit.

Or, if it is Manila twine, the first step in its long pilgrimage was under the guidance of a bare-footed, brown-skinned little Filipino savage, who perhaps never heard of a binder, and whose views of agricultural implements are a pointed stone or a crooked stick.

Yet, if it were not for the industry of these two widely separated nations, the farmers of this rich state would still be obliged to bind their grain with old-fashioned wire, which never worked or with untrustworthy cotton strand. In fact, the problem of twine was the problem of successful binding for years after the self-binder was an established fact.

It took many years and thousands of dollars to eliminate this primary drawback to the early grain growers of the country. One manufacturer alone spent \$15,000 trying to make twine out of grass, \$35,000 using paper as a substitute, and \$43,000 on straw—all in the end to be discarded as unsatisfactory. Then, after searching the world with a close tooth rake, as it were, it was found that two fibres could be made to do the work—Manila and Sisal. The Manila—long, soft and even—had generally been used in multiple strands for making cable and cordage; while the Sisal—strong, pliable and smooth—was found to lend itself perfectly for the manufacture of a single-strand cord, such as the self-binder necessitated.

Then commenced a merry struggle between the distant races for the honor of supplying the twine which was to make His Majesty, the American farmer, the greatest food producer in the world. At first, owing to the established position of the Manila hemp trade caused by the cordage industry, the little brown brother in the Philippines forged ahead, but he made no progress in his methods of production, using the knife and block and other simple methods followed by his primitive forefathers in extracting the fibre. It was soon seen that Sisal would either be the ultimate material to supply this demand or the demand would not be filled. At this point of the race a number of clever, aggressive Yucatecans, educated in the sciences in this country and abroad sprang into the game. They saw the future commercial possibilities of the neglected Sisal plant. At their own expense they built railroads into the

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arid, dry territories where henequen grew. They invented new machines, capable of cleaning 100,000 leaves a day, and soon began to compete on an equal basis with the Manila fibre.

The Spanish-American war temporarily advanced the price of Manila fibre to such an extent that good grades of Manila fibre commanded a price which was practically prohibitive for binder twine. Therefore, manufacturers of binder twine concentrated their energy and genius in the production of a perfect binder twine from Sisal. This required some adjustment of machinery and some change in methods, but manufacturers of twine succeeded so that the twine made from Sisal has for some years been as perfect and satisfactory as any binder twine ever made from any material. This has resulted in the increased use of Sisal, until during the past season not less than 85 per cent, and possibly 90 per cent, of the material which went into the manufacture of binder twine in the United States was Sisal fibre.

First-class binder twine can be made from high-grade Manila fibre, but it is very difficult to make even a reasonably good article of binder twine from low-grade Manila. Before the American occupation of the Philippine Islands, the Spanish officials at times exerted their arbitrary power for the purpose of maintaining the quality of the fibre which was produced by the natives. It was not an uncommon thing for the governor of a district to seize a quantity of inferior fibre and publicly burn it in the middle of the plaza. This was an object lesson to the natives to produce better grades of fibre. However, since the Americans have taken possession of the Philippine Islands, no authority has been exercised and no influence exerted by the officials in connection with the quality of fibre. The result is a very much greater proportion of low-grade fibres than has ever been produced in previous years. Unquestionably, large quantities of this low-grade fibre will be used in the manufacture of binder twine for the harvest of 1910, and it is unnecessary to state that those who attempt to use twine made from this low-grade Manila fibre will have troubles of their own.

There may never be a famine in twine, but it is rather to the farmer's interest always to keep a weather eye on the future, and in this particular instance to secure his twine supply, whether it be Sisal or Manila, at as early a date as possible.

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Frederick Mayer, founder of the factories at Milwaukee and Seattle now bearing his name, came to this country from Niernstein, Hessen Darmstadt, in May, 1851, and immediately proceeded to Milwaukee, Wisconsin, where he entered the employ of R. Suhm as a journeyman shoemaker.

The spirit that prompted him to seek his fortune in the new world was soon responsible for another change, and in 1852, a year later, he embarked in business on his own accord making boots and shoes to order as only a German apprenticed artisan knows how. Subsequently a stock of goods was carried and a retail business conducted until 1880, when the manufacturer of shoes was engaged in at wholesale to the trade.

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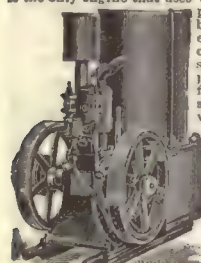
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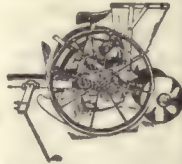
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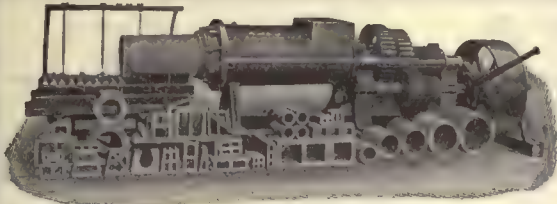
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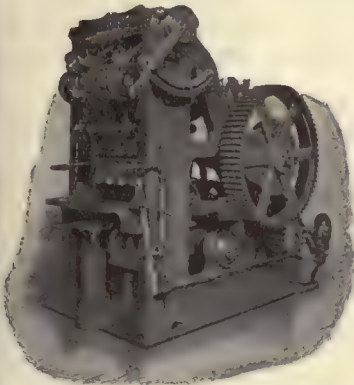
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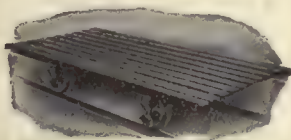
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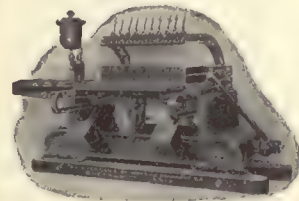
Wheelbarrows and Trucks



Eagle Repress



Dry Cars, all kinds



Hand and Power Cutters



Soft Mud Machines, Horse and Steam Power



Disintegrators



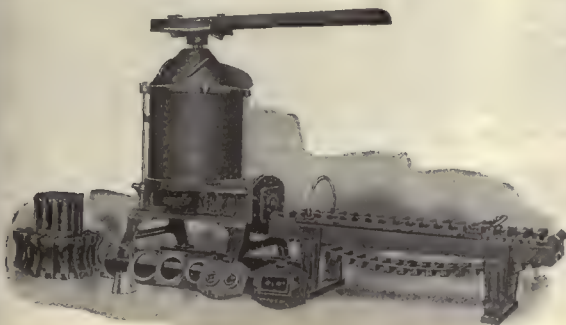
Hand Power Screw Press

Clay Working Machinery

"BUILT RIGHT—
RUN RIGHT"

We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

The American Clay
Mch. Co...Bucyrus, Ohio



Horse Power Plunger Machine



Products of our Auger Machines

Do Farmers Really

"We don't advertise in farm papers," said a big automobile maker the other day, "because the farmer wants too much for his money. Let him keep on buying cheap cars and in a year or two, finding that cheap cars are eventually the most expensive and unsatisfactory, he will come to us of his own accord. Then, when we know he is ready for good cars, we'll advertise in farm papers."

That man is making a serious mistake.

Farmers are buying, proportionately, no more cheap cars than are city people. Nor do farmers want "too much for their money."

What they do want is their money's worth, and that's why they are not buying \$5000 and \$6000 cars. The worth isn't in them.

Because farmers do want their money's worth is precisely why the Winton Co. advertises in farm papers.

We have been able to show hundreds of them that they get more for their money in the Winton Six than in any other car on the market—

More car

More service

More comfort

More satisfaction

More enjoyment

More freedom from breaks and from bills and from expense.

It is undeniably true that cheap cars are expensive.

They **fall short** in their carrying capacity, power, hill climbing ability, and durability.

They are in service only a little while until the owner finds his car isn't nearly as good as it looks in advertising.

And that fact is emphasized again and again when the car is laid up, day after day, for repairs. The owner finds it necessary to wire or write the agent or send through the agent for one repair after another.

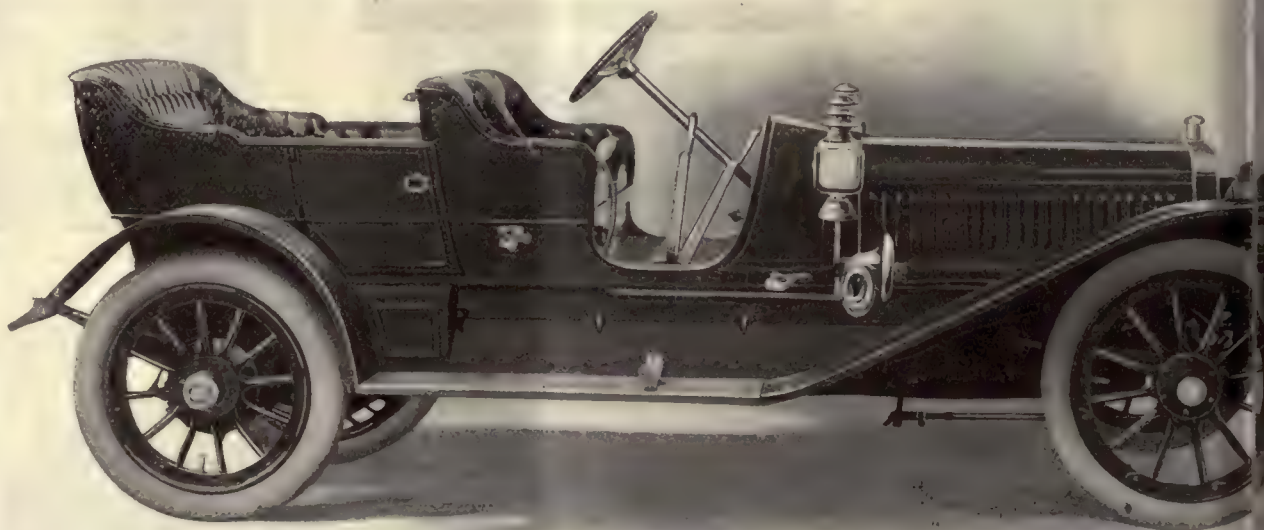
It is the old story of the cheap horse over.

You can buy a horse for \$10, but the horse gets done proving to you that he is only a \$10 horse.

Buying an automobile is like buying anything else—a piano, for instance. You can buy a piano for \$100, and it's just a piano.

Or you can buy one for \$300, that could be proved upon at any higher price.

Or you can buy one at \$600 and, like Franklin, "pay too much for your whistle."



THIS IS THE FOUR-PASSENGER WINTON SIX TOY TOURING CAR

When writing to advertisers please mention The Irrigation Age.

Not Cheap Motor Cars?

on the extremely cheap
on the extremely expensive
e is always a standard,
edium, a price represent-
l value and a product
price.

omobiles this standard is
te 48 H. P., six-cylinder,
nger Winton Six. This
anufactured entirely in
ificant big plant of the
Motor Carriage Company
and, under the personal
on of Alexander Winton.

Winton produced the first
ally successful gasoline car placed on the
in 1897.

When he has made more good cars than any
single designer in America.

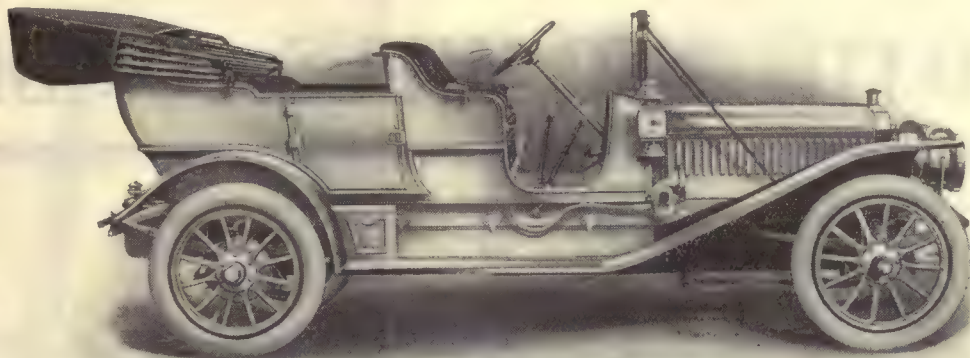
oughly practical man, Mr. Winton's constant
een to make the best car on the market and
or the lowest possible price.

the people a car of better quality than they
elsewhere at anything like the price is the
r Winton success.

our facilities we simply could not make a
than the 1910 Winton Six—at any price.

Winton Six has a six-cylinder motor, because
s six cylinders to produce **continuous power**.
and four-cylinder motors produce jerky
d that is a chief reason why they run up
air bills and wear out quicker than the
ix.

Winton Six made the world's record of 184,190
\$142.43 upkeep expense, which averages 77c



WINTON SIX

per 1000 miles. Let us send you the sworn state-
ments and detail figures of this marvelous performance.

The Winton Six, because of its six cylinders and
continuous power, is the smoothest running, most
comfortable, best hill-climbing car in America—in ad-
dition to being the least expensive to maintain.

We especially urge our readers not to buy **any car**
until they learn the reasons why no automobile ought
to be sold that has less than six cylinders.

The Six is the only car that represents **mechanical**
honesty. All other types are mere makeshifts.

Furthermore, the Winton Six motor **cranks itself**.
Air pressure does it. We avoid the physical labor of
hand-cranking and the mechanically violent method
of starting on the spark. Ours is the only motor that
actually cranks itself.

Our 64 page catalog gives [the simplest possible ex-
planation of four-cylinder and six-cylinder cars, and
is worth reading—no matter what car you are think-
ing of buying.

Write us today.

Winton Motor Carriage Company

Licensed Under Selden Patent

CLEVELAND, U. S. A.

BRANCH HOUSES

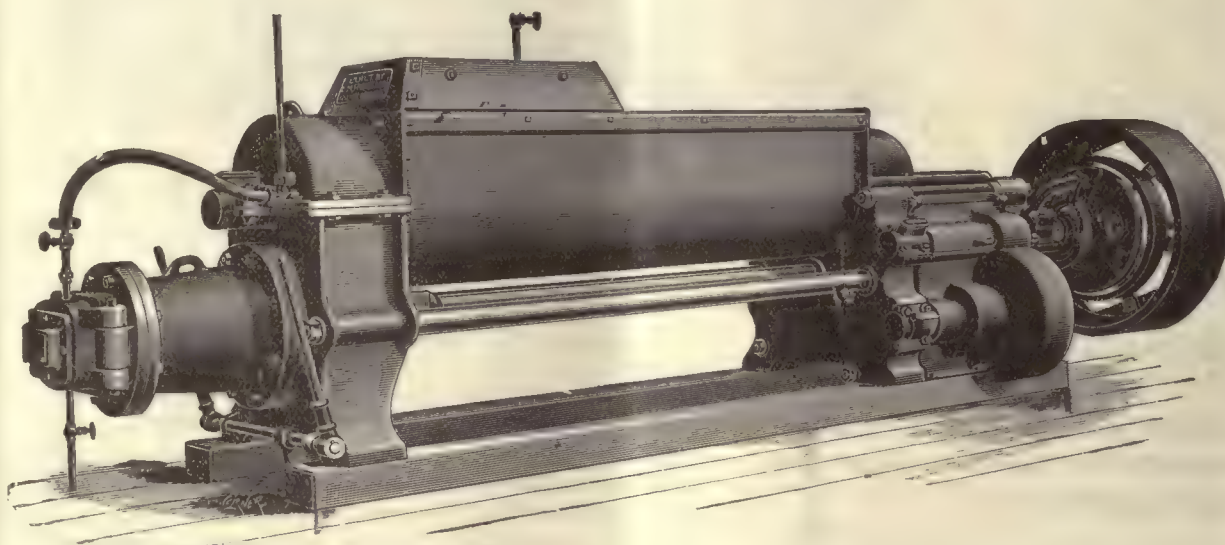
and 70th St., New York; Berkeley and Stanhope Sts., Boston; Broad and Race Streets, Phila-
9 N. Liberty St., Baltimore; Baum and Beatty Sts., Pittsburgh; 738-740 Woodward Ave.,
Michigan Ave. and 13th St., Chicago; 16-22 8th St. N., Minneapolis; 715 East Pine St.,
10 Van Ness Ave., San Francisco.

The Winton Motor Carriage Co. 86 Berteau Road, Cleveland, O.
Please send Winton Six literature to
We can quote especially low prices on
some of our used cars. These
are genuine bargains. The
quality in every case is
A 1.

When writing to advertisers please mention The Irrigation Age.

UNION MACHINES

WITH PUG MILLS COMBINED



FIVE SIZES ALL CAPACITIES

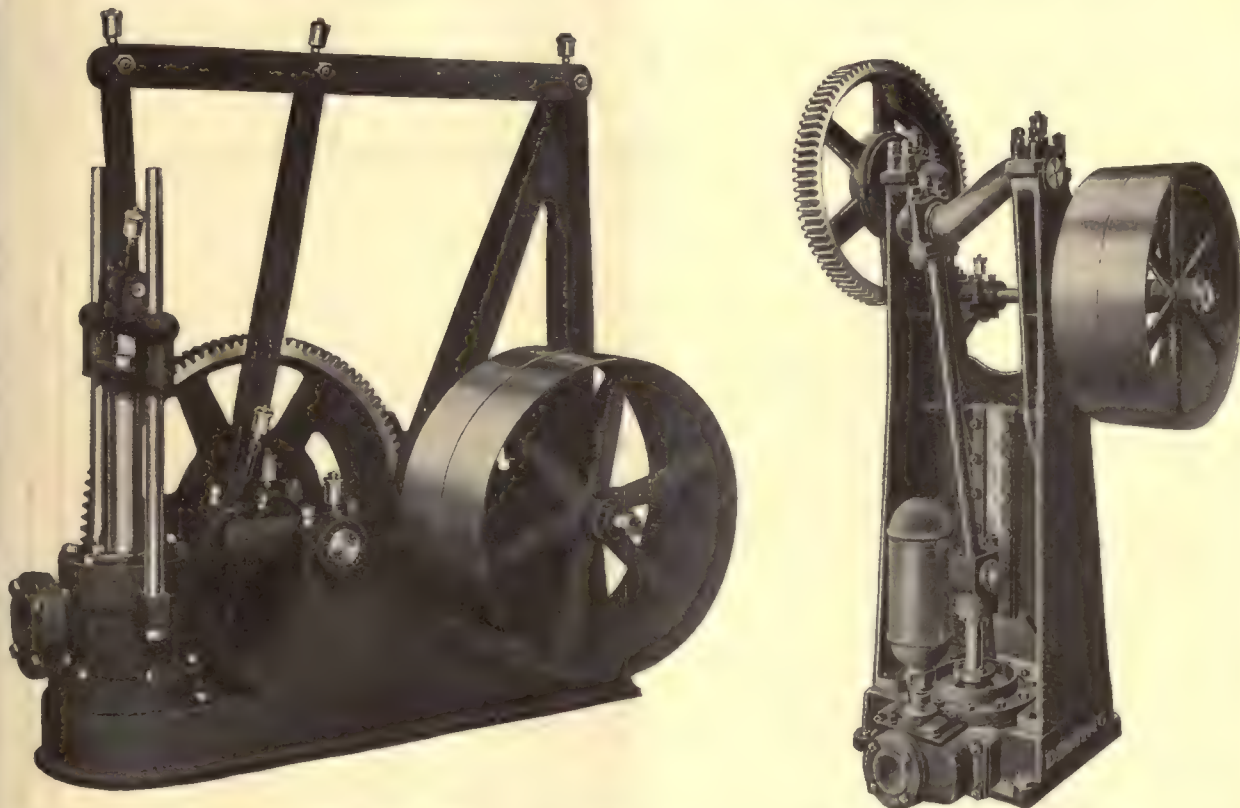
Outfits for Drain Tile, Hollow Ware, Building
and Paving Brick and other Clay Products

If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

When writing to advertisers please mention The Irrigation Age.

Deep Well Working Heads



These Working Heads Can be Operated by Electric Motor, Gas or Gasoline Engine, Steam Engine or Belt Driven—the Motors and Engines being Direct Connected if Desired.

The chief advantage to the possessor of a Deming Deep Well Working Head is in the immense saving of power money in direct proportion to the great depths from which the water can be pumped.

Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

THE DEMING COMPANY, SALEM, OHIO

HAND AND POWER PUMPS FOR ALL USES

Including Spray Pumps, Nozzles and Accessories

HENION AND HUBBELL, Chicago, Ill., General Western Agents

Other Agencies in All Principal Cities

\$ 33



The Low One-Way Colonist Rate
from Chicago

to

Portland, Tacoma, Seattle

and

Other Pacific Northwest Points

Effective Daily

MARCH 1—APRIL 15, INCLUSIVE, 1910

Via

Union Pacific

"The Safe Road To Travel"

Take The New Through Train—
The Oregon-Washington Limited

Tickets good on Tourist Sleeping Car on payment of berth rate.

Leaves Chicago via C. & N. W. 10:00 p. m. daily

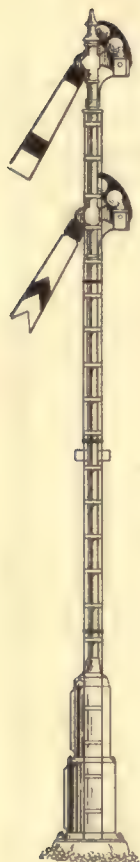
Electric Block Signals

Dining Car Meals and Service "Best in the World."

For tickets and information call on or address

W. G. NEIMYER, G. A.

120 Jackson Boulevard, Chicago, Ill.



THE IRRIGATION AGE

VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO 5

CHICAGO, MARCH, 1910

THE AUSTIN DRAINAGE EXCAVATOR



Carves a ditch with sloping banks from the natural soil. It works to templet, and the banks and bottom are cut as smooth as can be done by the most careful hand labor. The result is that no extra excavation is required to provide for washing and filling. Earth is dug for every cent the owner pays, and the contractor gets pay for every ounce of earth dug. It does this digging at a unit cost cheaper than a similar ditch can be dug by any other means.

The Austin Levee Builder
The Austin Side Hill Ditcher
The Austin Tile Ditcher

OUR FULL LINE COMPRISES:
The Austin Highway Ditcher
The Austin Drainage Excavator
The Austin Orange Peel Ditcher

The Austin Drag Line Excavator
The Austin Rolling Platform Traction
The Austin Stump Puller and Grubber

WE SELL OUTRIGHT OR LEASE.

Send for Catalogue "S"

F. C. AUSTIN DRAINAGE EXCAVATOR CO.,

Railway Exchange
Chicago, Ill.

N. B.—AGENTS WANTED IN UNOCCUPIED TERRITORY

Morris Machine Works

Baldwinsville, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

New York Office
39-41 Cortlandt Street
Houston Office
Cor. Wood & Willow Sts., Texas
Henion & Hubbell, Agents,
223-231 N. Jefferson St., Chicago.
Harron, Rickard & McComb,
Agents
21 Fremont St., S. Francisco, Cal.



THE IRRIGATION AGE COMPANY, Publishers,

CHICAGO, ILLINOIS

The Temple Irrigation Equipments the most Economical and Certain Means of Lifting Water

55 YEARS' EXPERIENCE

Write us for Information and Prices—State Requirements



CENTRIFUGAL PUMP AND GASOLINE ENGINE IRRIGATION OUTFIT.

The Temple Water Elevators -- The Temple Centrifugal Pumps

Manufacturers of all kinds of Hand and Windmill Pumps

Also Manufacturers Single Cylinder, Double Cylinder and Four Cylinder Gasoline or Kerosene Engines

Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

THE TEMPLE PUMP CO.

Factory, 15th St. and 15th Place, near Canal St.
Chicago, Ill., U. S. A.

Get First Crop Started Quickly

Make Your Money
Come Back Quick

20th Century Grader

COMPEL your land to return your investment with big interest. You must take advantage *now*—this spring—of every passing hour. Every minute means money, means profit if you move quickly with the right machinery.

By the newest method you can get onto your land, this spring clear it of sage brush, level off the hummocks, and fill in the hog-wallows, cut your laterals, connect with the supply canal, get crops this same season.

One man—*you*—with four horses can do "wonders" with the 20th Century Grader and Ditcher, you can grub, level, cut and clean laterals, throw borders, make roads, move dirt as you choose.

Grubbing

No. 1—20th Century with Grubber lifted



Here's your quick grubber. The moldboard has been removed, the grubber fixed in its place. To the steel upright, at its bottom are bolted two keen-edged, crucible steel knives. The driver with a convenient lever drops or raises the grubber as he pleases. These two knives pass along beneath the surface and slash off the small roots at the weakest place. Read the rest of the story in the catalog. Cut off the "Free Ticket" below and send it in. It explains why—

Plowing Isn't Necessary

No. 2—20th Century with Grubber in ground 5 inches



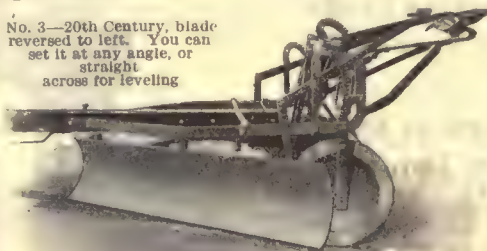
If you don't have to plow you get your planting done quickly, and get all the benefit of the first water turned on. Grubbing with a 20th Century costs \$1.25 to \$1.75 per acre. You—*one man*—can grub 4 to 5 acres a day.

Leveling

"Convenient"—that's the term—that applies to the 20th Century. Its reversible moldboard can be swung to any angle for leveling and grading.

You must slope your land at a gradual angle from your main ditch. The 20th Century will do it for $\frac{1}{2}$ to $\frac{1}{3}$ the usual cost. You—*one man*—can do it. The new catalog tells how. Cut off the Ticket below and get catalog free.

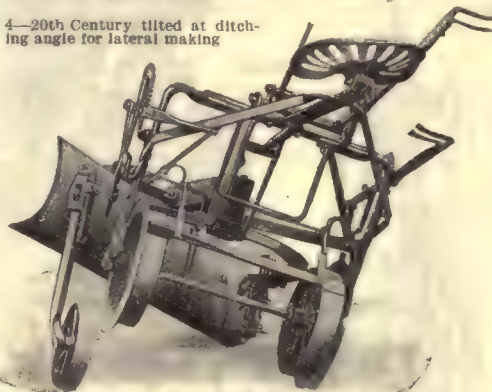
No. 3—20th Century, blade reversed to left. You can set it at any angle, or straight across for leveling



Cutting Laterals

"V Shaped" laterals carry water with least waste. 20th Century cuts them 12, 15, 18, 24, 36 inches deep. Cost \$1.25 to \$1.50 a mile. One man—*you*—can cut

No. 4—20th Century tilted at ditching angle for lateral making



four to five miles a day. Once up, once back in moderately soft ground is sufficient for an 18-inch lateral. Send the "Free Ticket" below for a "fistful" of particulars in our catalog.

THE BAKER MANUFACTURING CO.
726 FISHER BUILDING, CHICAGO

FREE TICKET

To the Baker Mfg. Co.,
726 Fisher Building, Chicago

I own _____ acres of _____ land
(how many) (raw or improved)

in _____ Please send me that new catalog.
(location)

Name _____

Address _____

Town _____ State _____

Myers Power Pumps

Working Heads, Pumping Jacks, Cylinders, Etc.

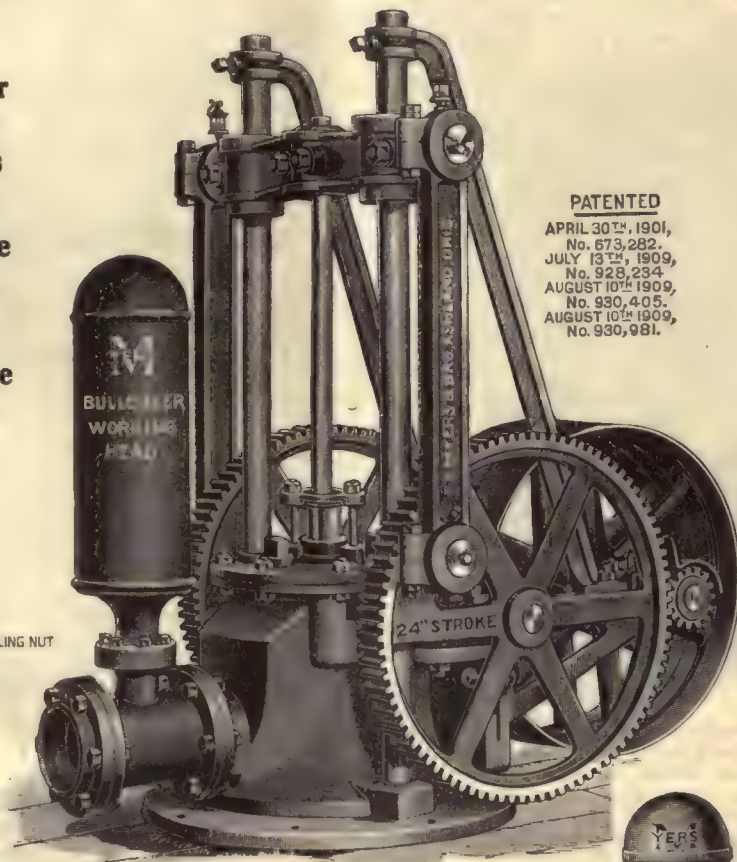
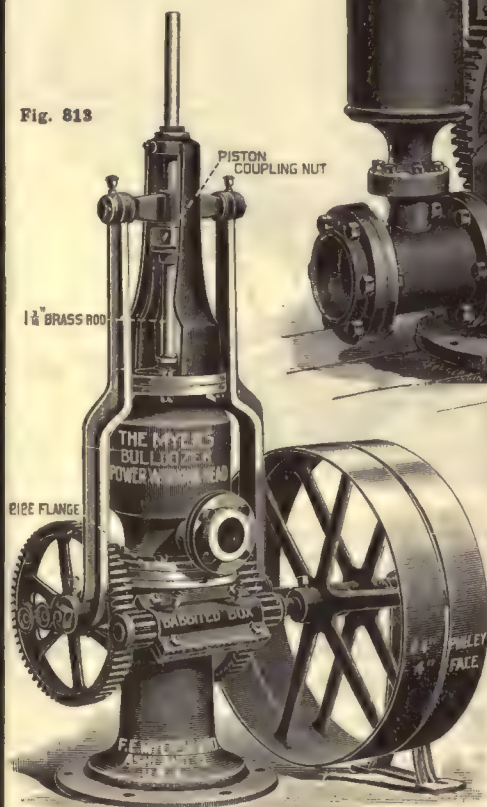
PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches

Fig. 813



PATENTED

APRIL 30TH, 1901,
No. 673,282,
JULY 13TH, 1909,
No. 928,234,
AUGUST 10TH, 1909,
No. 930,405,
AUGUST 10TH, 1909,
No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

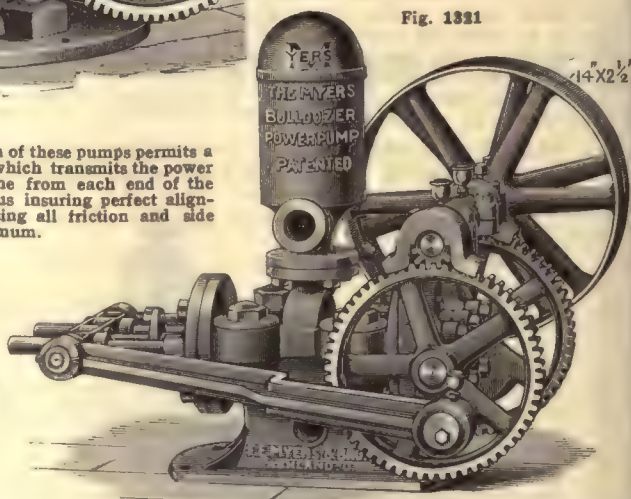
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

Fig. 1331



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

Write
for
Catalogue
and
Prices

F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS

When writing to advertisers please mention The Irrigation Age.



SUPERIOR
THE NAME TELLS A TRUE STORY

SUPERIOR DRILLS are Used and Appreciated by Good Farmers the World Over

SEND FOR CATALOGUE NOW
GENERAL AGENTS FOR WESTERN TERRITORY:

Dean & Co.,	Minneapolis, Minn.
Kingman & Co.,	Peoria, Ill.
Kingman St. Louis Implement Co.,	St. Louis, Mo.
Kingman-Moore Imp. Co.,	Kansas City, Mo.
Kingman-Moore Imp. Co.,	Oklahoma, Okla.
Kingman Implement Co.,	Omaha, Neb.
Parlin & Orendorff Imp. Co.,	Portland, Ore.
Colorado Moline Plow Co.,	Denver, Colo.
The T. C. Powers Co.,	Helena, Mont.
Consolidated Wag. & Mach. Co.,	Salt Lake City.
Newell Matthews Co.,	Los Angeles, Cal.
The H. C. Shaw Co.,	Stockton, Cal.

Eastern Farmers please write direct to the Manufacturers
AMERICAN SEEDING MACHINE CO., (Inc.)
Springfield, Ohio

GRAIN DRILLS

All the Grand Prizes and All the Gold Medals

Given to pumps by the Alaska-Yukon-Pacific
Exposition at Seattle last summer were awarded to

AMERICAN PUMPING MACHINERY

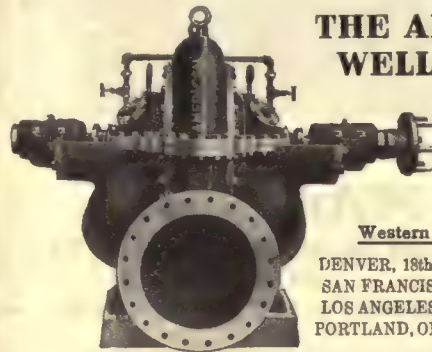
Few users of pumps realize that the efficiency of the centrifugal pump has been doubled during the last ten years and it is now the simplest, most dependable and most economical pump made.

The reason why "American" Centrifugals attain higher efficiencies than any other is, they have more refined flow-lines and there is the least possible resistance, caused by sudden change of direction and eddies of fluid when passing through the pump.

This feature enables the single stage "American" Centrifugal to attain mechanical efficiencies of 60 to 80 per cent. on total head up to 125 feet and make them the most economical pumps for irrigation purposes.

"American" Centrifugals are made in both horizontal and vertical styles, in any number of stages, in any size and equipped with any power.

Write for efficiency tests of "American" Centrifugals by one of the most eminent hydraulic engineers of the Pacific coast. Complete catalog free.



THE AMERICAN WELL WORKS

General Office and
Works

AURORA, ILL., U.S.A.
Chicago Office
First National Bank
Building

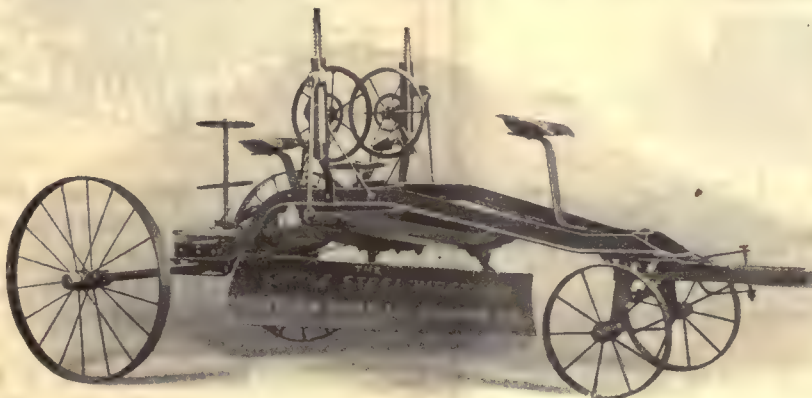
Western Sales Agencies

DENVER, 18th and Lawrence Streets
SAN FRANCISCO, 523 Market Street
LOS ANGELES, 160 N. Los Angeles St.
PORTLAND, ORE., 2d and Ash Streets

The Little Western Steel Grader and Ditcher

**IT
WILL**

Grade
Roads
Make
Ditches
Cut
Laterals
Save
Money



**IT
WON'T**

Break
Get Out
of Order
Tire the
Horses
Prove
Expensive

—THE BEST—
"GENERAL PURPOSE" Grader and Ditcher Built

TRY ONE AT OUR EXPENSE

Also Excavators, Heavy Graders, Wheelers, Drags, Plows, Etc.

THE AUSTIN-WESTERN CO., Ltd., Dept. I, CHICAGO

2
OR
4
HORSES

1
OR
2
MEN

When writing to advertisers please mention The Irrigation Age.

Galvanized Steel Irrigation Flumes and Water Troughs



For catalog and prices address

P. MAGINNIS

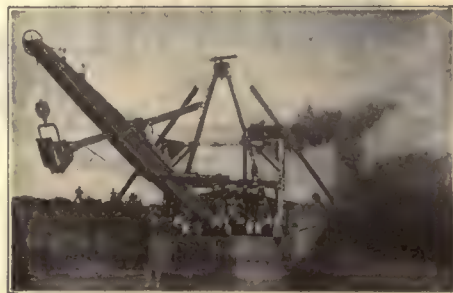
Home Office and Factory, **KIMBALL, NEB.**
—OR—

T. C. EGLESTON, 714 Ideal Bldg., Denver, Colo.

Ditching Dredges, Placer Mining and Traction Dredges

SUITABLE FOR ALL CLASSES OF WORK

Steam Shovels—All sizes
Ballast Unloaders



Write us for information, giving particulars
of requirements

The Marion Steam Shovel Co.,

MARION, OHIO

G. W. BARNHART, Western Manager
718 Monadnock Building, San Francisco, Cal.

F. H. HOPKINS & CO., Montreal, Quebec

WHY NOT BE COMFORTABLE?



Use an Enterprise Tent Cot.

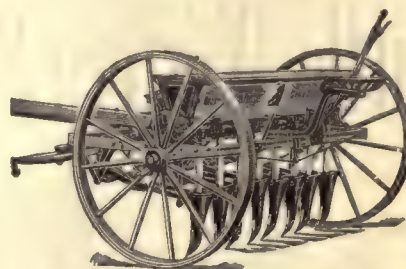
There is nothing made so adaptable
for out-door sleeping. It is practical,
light, portable, bug proof, fly proof, sun
and shower proof. Just the thing!

Write to

ENTERPRISE BED CO.

HAMMOND, IND.

They will Send You Their Illustrated Catalogue.



**HOE
DRILLS**
Plain
and
Fertilizer

HOOSIER HOE DRILLS HAVE BEEN STANDARD
FOR MORE THAN 50 YEARS

Made by

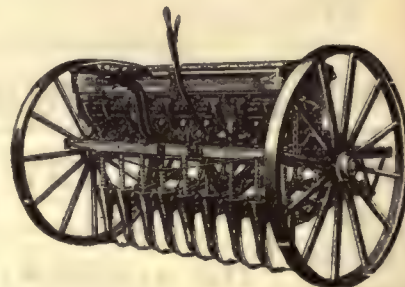
**THE AMERICAN SEEDING
MACHINE CO.**

(Inc.)

RICHMOND, IND., U. S. A.

Supplied
in all
Styles and
Sizes.

Grass Seed
Attachments
May Be
Added.



Twenty-fifth Year

THE IRRIGATION AGE

VOL. XXV

CHICAGO, MARCH, 1910.

No. 5

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price,
\$2.00. If ordered in connection with subscription, the price is \$1.50.

Age Enjoys Steady Growth.

Our readers have, no doubt, observed during the past year, the rapid growth of the AGE in a business way. They are, perhaps, not so familiar with its growth in the direction of circulation.

The year 1909 was the best in the history of this publication in point of circulation growth and earnings from advertising.

We are now issuing a fifty-two page paper regularly, where last year at this time we were printing only thirty-two pages. This, to the publisher, and the man acquainted with newspaper work, indicates a large increase in income, but not necessarily a proportionate increase in earnings.

The AGE is in a position today occupied by very few publications in the United States, viz: that of having enough signed business on its books prior to March 1st, to pay the running expenses for the year 1910. It is reasonable, therefore, to suppose that the year 1910 will double the volume of business of 1909, and the net results from this year should prove two or three times greater than those of last year.

From this statement there can be gathered an idea of the immense interest now being taken by the eastern public in irrigation.

Success for the IRRIGATION AGE is but a proof that western energy and enterprise has won.

SUBSCRIPTION PRICE.

To United States Subscribers, Postage Paid, . . . \$1.00
To Canada and Mexico, . . . 1.50
All Other Foreign Countries, . . . 1.50
In forwarding remittances please do not send checks on local banks. Send either postoffice or express money order or Chicago or New York draft.

Official organ Federation of Tree Growing Clubs of America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 25 years old and is the pioneer publication of its class in the world.

"Why Not Start an Irrigation Journal?"

If the bald statements of their promoters are to be believed, the launching of an irrigation journal and its rapid flight into extreme influence and mammoth circulation is a much less arduous work than the traditional ease of "falling off a log." And if the "wind" is right and the "air" is heated to the right temperature, the flight to success becomes the more marvelous and astounding.

Several irrigation journals have sprung into existence almost within a fortnight and have rapidly passed through the swaddling-cloth, knickerbocker and college-cap periods until they appear upon the stage of life's action with the full powers and influences of mature existence. Tomorrow—yes, even before tomorrow, they may rival in circulation any magazine, periodical, publication or paper that ever presented itself before the American people.

But what hard-heads are these advertisers? How foolish in them to demand proof of circulation? When a feather flies up the chimney can they not see that it is flying—the hot air has nothing to do with its progress? What sordid commercialism pervades the advertising field, insisting upon prospective delivery of results before investing in display space? Why not spend money and "take a chance?"

To the legitimate journal that shall enter the irri-

gation field and assist in the great work of directing eastern people to prosperous, happy homes in the west, the IRRIGATION AGE offers its co-operation and the exchange of fraternal courtesies. The field is growing with each succeeding year. The west needs every assistance that it can rally to its standard. There should be no friction between workers in a common cause.

But any journal that inflates its circulation, exaggerates its influence, or deceives its advertisers into expectation of results that can not be returned, is as great a menace to irrigation and colonization work as the wild-cat bond scheme or the dollar-a-week land seller. Eastern advertisers demand proof of circulation before investing in space and, likewise, western land sellers should be equally cautious in spending money for publicity unless it can be demonstrated that the number of readers is sufficient to warrant expectation of results.

In this respect, the AGE speaks only from desire to protect the public against unnecessary loss through investment in spurious forms of advertising. In another column will be found the publisher's statement of growth of this journal and its assured success.

So-Called "Carey Act Guides."

As might be expected under the circumstances, the Renaissance of interest in the lands of the "West" has brought with it a harvest of publications purporting to guide the footsteps of the uninitiated in his quest for public lands. Some of them contain information of real value, while others bear the unmistakable evidences of having been hastily thrown together by novices or shirkers whose only purpose appears to be the garnering of the dollars of the unwary.

It is an unfortunate condition that prevents the Federal Government from issuing a comprehensive and popular review of all the statutes and regulations of interest to the landseeker, or indeed, a codification of the land laws to date; although, as is well known, pamphlets treating of the various land laws, separately, are distributed gratis, by the Land Office to all applicants.

As a case in point, the AGE has recently come into possession of a work entitled the "Carey Land Act," priced at one dollar, which contains a brief summary of the regulations adopted by the State of Idaho, presented "as applying to the States of Idaho, Washington, Montana, Colorado, Wyoming, Utah, California, North Dakota and South Dakota." It appears incomprehensible that any one preparing a treatise, for profit, upon so important a topic should

permit so palpable an error to appear upon the very title page. It is a fact of which one may convince himself by inquiry of the proper authorities, that the states of Washington, California and North Dakota have never adopted the provisions of the Carey Act, and for natural reasons, never will. On the other hand, all references to Oregon and New Mexico—states holding great potential possibilities, as well as of South Dakota, have been omitted.

Our readers may judge for themselves how misleading such a classification may prove. Those who have followed the scholarly recital of the provisions of the individual states now appearing in the AGE prepared by Mr. Bohm need no specific mention of the many important details of Carey Act administration, with reference to which the states are at great variance.

The AGE welcomes anything designed to promote the general diffusion of knowledge, but it would be false to its principles were it to omit a note of timely warning, against such rubbish.

"Back To the Land."

In a recent contribution to the Chicago Examiner, headed "Back to the Land," Milo Hastings tells the interesting story of reclamation work that has brought under cultivation more than three millions of acres of arid land and has provided homes for nearly a quarter of a million of people. In explaining the terms of the old Homestead law he notes the difficulties encountered by the Reclamation service in relation to the division of land and the solution of the problems presented by the private ownership of large tracts desired for irrigation purposes. This leads to explanation of means taken by the Reclamation service to force heavy land owners to sell their holdings.

He asserts, in fact, that the methods employed by the government through its reclamation service, e. g. the stirring up of sentiment against the land owner and his forced acquiescence even at great financial loss to himself, was justified by the results—the creation of thousands of homes for the people.

But in his study of previous conditions Mr. Hastings fails to recognize the injustice to those ranch owners who had completed fairly comprehensive irrigation systems at considerable expense and had themselves been the pioneers in reclaiming arid lands. The IRRIGATION AGE has, in years past, taken the attitude that the land owner who, by his industry and perseverance had builded himself a home at the expense of his own happiness, should not be disturbed in the enjoyment of the fruits of his labors. In forcing him to abandon his holdings, by raising public sentiment against his attitude and thus causing his ostracism from social affairs, government agents were guilty

of gross violation of the very Declaration of Independence. Other and less autocratic means ought to have been adopted by the Reclamation Service and its agents.

In his article, admirable for its scope in many directions, Mr. Hastings fails to enter discussion of the problem that caused much comment a few years ago—the lack of proper colonization work for government projects. It is a notorious fact that while the machinery of the government is vainly endeavoring to lead prospective settlers to homes on the irrigation projects, private companies are meeting with excellent success in their colonization work. Nor can there be hope for change in the existing conditions until the government shall so change its operations,—perhaps the laws that regulate its work,—to afford settlers the same rights and privileges allowed under, for instance, the Carey Act.

To the Carey Act settler who has proved up his land, broken the soil, constructed laterals and is distributing water over his crops, there is an avenue through which he may gain of the comforts of life, even though he has found it necessary to invest his entire savings to become thus established. Through his title to the land he may seek the bank or other money lending institutions and secure sufficient funds to build a respectable home for his family or buy such machinery as is necessary for the proper working of the land or the harvesting of crops. His ownership of the land and his proven intention to make it his home are enough to satisfy the money loaner.

Contrast with these conditions the situation as relates to settlers on government tracts and the reason for the prompt sale and settlement of district, private or Carey Act projects is readily understood.

But there are other essential differences between the conditions that obtain among settlers on private projects and those under Federal control. Having completed the work as outlined by its engineers and supplied water to the land, the government assumes no further responsibility for the welfare of settlers. There is no paternal interest on the part of the government. It has supplied the water; settlers must care for themselves. Reclamation service officials have no interest in the individual settler. There is a lack of coordinated effort, for the various departments exist separately and official precedent prevents cooperation. Reclamation work is too often viewed from an engineering standpoint and the great object of all—the creation of a prosperous community—is subordinated to the technicalities of the work.

Here again the private enterprise gains an advantage. From inception of construction work until the last acre is sold, each division of the private project

works together for the common end—the creation of real value that shall be saleable upon the open market. An aggressive campaign of exploitation is opened. Peculiar values of land are proven by attractive publicity matter; provision is made, by employment of expert agriculturists, to insure heavy crops and prevent failure; the growing colony of settlers is watched with an interest that not only brings aid to the unfortunate but results in each settler becoming an enthusiast and a booster for his own community. The old saying that “each friend that has a friend, has a friend that has a friend” is fully recognized in the settlement of these private projects. It is to the company’s interest that only optimistic reports shall be sent to the “friends” in the east. The head of a private company not only supplies the water, as does the government, but he takes another long step to successful colonization by insuring, so far as is within his power, the prosperity and happiness of the individual settler.

Forced into competition with these private projects, the government is at a long disadvantage. Organized effort is woefully lacking; cumbersome practices destroy attempt at modern methods. The chief agency of the government at present is to stir up interest in irrigation—only to have private companies catch the intending settler and close the deal by superior salesmanship.

For many years the IRRIGATION AGE has consistently urged the necessity of a government colonization system similar to that adopted by Carey Act and private project managers. This problem has confronted the Reclamation Service for many months yet no solution has been presented. It is to be believed that the all powerful rules of precedent have prevented any employe in this department from taking the initiative. No manager of a private project would permit of inaction in this direction were his organization suffering from similar trouble.

Unless Reclamation officials realize the importance of colonization work and open their eyes to the prospective loss to the government, great areas with the federal irrigation projects, now nearing completion, must remain unsettled and the burden of carrying high maintenance charges will fall heavily upon the few hundreds of settlers.

In the course of his article, Mr. Hastings discusses the subject of forcing a land owner to relinquish all but 160 acres of his holdings. He says:

“How would it seem to the owner of 160 city houses should he be told that one home is enough for on man and that he could not have the benefits of a new water works or sewerage system if he did not sell off his surplus possessions. Yet this is exactly

what a conservative republican administration at Washington is saying to the land owner in the Salt River Valley."

This brings to the writer's mind very clearly, the fact that a large land owner in the Salt River valley was very much opposed to the government's attitude along this line at the time work was begun on the Roosevelt dam. He and his relatives were so much opposed that they wrote letters and fought the proposition up to a certain point, and then like the boy on the river bank, dived into the stream, swam under the lily pads and came up on the other shore. This gentleman has passed over to the government side, fought for them at congresses and other public meetings and the general supposition by those who have followed the case closely is that some arrangement has been made between his interests and the Reclamation Service, whereby the law would not be enforced in this case. The AGE has no definite knowledge of this but is forming judgment merely upon the attitude of this individual. No man could be so forcibly against a proposition one day and so thoroughly in favor of it the next day unless some sort of a fair arrangement had been entered into with the powers that be and we trust to be able to give facts concerning this particular case which has, no doubt, been duplicated in numerous instances in various parts of the country. If concessions were given to millionaires why should they not be given in equal ratio to the man who holds 640 acres under the government ditch in Idaho, or the fellow who has 320 acres under the Klamath project in Oregon or the Yuma project in Arizona and California.

Advance Orders for Carey Act Pamphlet. Numerous letters of inquiry as to the time at which the series of articles on the Carey Act, prepared by Mr. E. F. Bohm and now appearing in this journal, shall be ready for distribution in pamphlet form, is conclusive evidence that the work is meeting with popular approval and will be in great demand.

Because of the fact that Mr. Bohm assumed this work at the earnest solicitation of the publisher of the IRRIGATION AGE, only under condition that it be allowed no general distribution until the series of articles had been concluded, it will be impossible to fill at present the many advance orders now being received.

Persons desiring to secure a copy of the forthcoming pamphlet should notify the publisher in advance to permit of proper registration in this office. Notification of the cost per copy and the date of distribution will be mailed to prospective purchasers in ample time to insure delivery of a copy of the first edition to all who desire.

Employees Quitting Federal Service.

What is the cause that induces the brightest employes in the Reclamation Service to withdraw their names from the government pay roll and become identified with private projects, or enter private business life? The question is urgent for within the past two months three of the brainiest men in the service have terminated their federal employment.

First to announce his withdrawal was Mr. Ira W. McConnell who has connected himself with the well known firm of J. G. White & Co. J. C. Waite, who was with the service at the Chicago office, next announced a change to the Kuhn-Hollister interests. Consulting Engineer D. C. Henny was the most recent in his announcement that he would enter private practice, although continuing to give his advice to the Reclamation service.

Following the natural course of reasoning it is to be supposed that each of these experts found a field for greater remuneration and that they were impelled to the change by this consideration. It cannot be intimated that the head of the Reclamation service is other than most considerate to his subordinates.

In these resignations of three capable employes there is a note of warning to fixers of the government salary list. It is indeed a fallacious policy that will allow private concerns to secure the services of employes whose experience and abilities are of inestimable value to the government in the many huge irrigation works now in progress.

National Farm Land Congress. As we go to press, we are advised by Mr. Don Farnsworth, President of the National Farm Land Congress, that within the next few days a Call is to be issued, summoning the members of the Executive Committee and of the Advisory Committee of the Congress (appointed at the First National Convention), to a meeting to be held early in April, at Chicago, for the purpose of perfecting a permanent organization.

In the AGE of last December appeared a full report of the Proceedings of the First Meeting of the Congress. Among the important Resolutions adopted at that time was one authorizing the action now contemplated by Mr. Farnsworth.

The success attending the first gathering augurs well for the outcome of this event. A permanent organization, constructed upon the model of other Congresses, devoted to kindred subjects, appears to be all that is needed to carry the work inaugurated by Mr. Farnsworth, and Mr. Walsh of the Chicago *Examiner*, to a permanent and triumphant issue.

The date of this meeting will be fixed with a view

to affording delegates to the first convention of the "Reclamation States" to be held at Salt Lake City,—also in April,—an opportunity to attend both gatherings.

IRA W. McCONNELL.



In discussing Mr. Ira W. McConnell, who has recently become identified with J. G. White & Company, one who is familiar with his history has the following to say concerning him and his connection with public work:

"Mr. McConnell was born in 1871 and graduated from Cornell university in 1897. In 1897 and 1898 he was employed on the United States Deep Waterways Surveys and in the United States Navy Yard, Brooklyn. During a part of 1898 he was engaged as contractor for the North Tarrytown sewerage system, and in the fall of that year returned to Cornell university as instructor in civil engineering, remaining there until 1900 when he became superintendent of construction for the Indianapolis water works. In 1901 Mr. McConnell entered the employ of Nash & Dowdle, general contractors, Chicago and New Orleans, as superintendent of the construction of the Chicago clearing yard, which involved a large amount of railroad work, and on the New Orleans drainage works. From January to June, 1903, he was professor of civil engineering at the Missouri School of Mines, going from there into the United States Reclamation Service as project engineer on the Uncompahgre, Colorado, project, the principal items of which were the Gunnison tunnel canal construction, unification of old canals and water rights and general administration of the entire project, involving the expenditure of over \$6,000,000, and on which work he was engaged from 1903 to 1907. During the past two years he has been supervising engineer of the central district, United States Reclamation Service, having general supervision of all government irrigation work in South Dakota, southern Wyoming, Nebraska, Colorado, Kansas, Oklahoma and northeast New Mexico, the principal projects being the Pathfinder reservoir, Interstate canal on North Platte river, Belle Fourche project, South Dakota, involving a large earth dam and canals, Garden City project, Kansas, a steam-electric plant for recovery of underflow, Uncompahgre project, Colorado, tunnels and canals, and the Grand Valley project, comprising large canal works. The annual expenditure of the district was about \$1,500,000, and the ultimate cost of the work under construction will involve an outlay of over \$25,000,000.

Mr. McConnell, as chief irrigation engineer, will have general supervision of all matters relating to irrigation undertakings. His headquarters will be at the main offices of J. G. White & Company, incorporated, 43 Exchange place, New York."

IRRIGATION AGE RANCH.

Readers of the IRRIGATION AGE will, no doubt, be interested in learning that the ranch owned by the editor of this journal, near Fountain, Colorado, is being placed in condition to produce good results during the summer of 1910. This land lies on the border of the town of Fountain, in a delightful section of Colorado, directly under Cheyenne mountain and Pikes Peak and within view of the Sangre de Christo mountains to the southwest and of the Spanish Peaks in the same direction, as well as Long's Peak and other prominent points of the Rocky Mountain range to the north and west. This is recognized as one of the most delightful locations, from a scenic standpoint, in the United States.

But since scenery has never been known to produce a bank account, the owner has carefully considered, quality of the soil, climatic conditions and adaptation of soil. It is obvious that this soil, supplied with water, is suitable for alfalfa raising and it has also been proven that fruit of all kinds thrives well. On adjoining ranches, apple, pear, plum and cherry orchards are to be found which have produced abundantly since they came into bearing. Mr. Riddoch of Fountain has plum, pear and

apple orchards which would do credit, in point of productiveness, to any fruit section in the United States. In laying out this land five acres were set aside to be planted this spring to four standard varieties of cherries; two acres will be planted to apples, plums, pears and peaches.

The orchard will be so laid out that a glance at the diagram will determine the kind of tree to be found at any given spot. In addition to the name of the tree, information will be given as to whether it is an early or late producer. This plan has already been adopted by the most successful orchardists.

Adjoining the two acre tract containing apples, plums, etc., a tract of about one acre will be set to dewberry plants. Ten acres of Mexican beans will also be planted. These have proven a profitable crop on adjoining lands. In fact, five acres nearby produced nearly \$1,200 net last year. In addition, there will be planted from two to three acres of potatoes, about three acres of onions, and such other garden truck as may be decided upon later.

With the assistance of Mr. F. P. Austin, who is one of the best agriculturists in that section, and acts as our superintendent, we hope to produce results which will be not only profitable but of interest to our many readers. All mishaps or errors in judgment will be as fully recorded in reports as are the successes, and it is hoped thereby to teach new irrigation farmers, who are readers of this journal, to avoid such mistakes as may be encountered in this work. This is considered to be the only fair way, even though it may at times be somewhat humiliating.

Within the past two weeks orders have been placed for one "Little Yankee" grader, one "Little Roadster" grader and ditch builder, one Milwaukee mower, one Milwaukee harvesting machine, one six horsepower International gasoline engine, one hay loader, suitable for swath or wind-row, one Bettendorff steel wagon, one hay rake, one two-way plow, a five row grain and seed drill and cultivator. In addition to this there is on the ground a large Hoosier seed drill. Arrangements have been made to ship two spraying outfits; one of the large Binks power spraying machines on iron trucks for treating trees. This is a combined engine and pump, and is said to be one of the best machines manufactured, and while this cannot be used on the work at present, it is believed that the superintendent, who has a large orchard of his own, may find it of value, as well as for use on neighboring orchards, whose owners have not yet attempted extensive spraying work. The farm is also provided with a smaller machine of this same make, which is propelled by hand, and is suitable for spraying trees and field crops. This machine can be used for applying sulphate of iron to kill thistles and other obnoxious weeds.

In addition to the area above mentioned there is a field of thirty acres with a fair stand of alfalfa. Owing to an accident to the ditch last year this field was not served with water, and the stand is not satisfactory. It is hoped, however, to reseed the sparse areas and produce several good cuttings of alfalfa this season.

Mr. Austin will write us regularly from month to month, giving his experience on ours as well as his own ranch, which is one of the best developed in the Fountain Valley. As work develops he will furnish photographs of farm machinery in operation and of the different fields and orchards.

These articles must prove interesting to our readers and we will appreciate comment from them and suggestions that will enable him to perform better work.

The first article will probably appear in our April issue, although at this busy season of the year it may be difficult for Mr. Austin to find time to write matter of this character. After these articles are once started, however, they will be continued regularly.

At present work on leveling and laying out the land for the orchard and field crops is progressing. In this work there is being used in addition to the "Little Yankee" grader, a homemade level prepared by Mr. O'Reilly of Fountain, who has had experience in the Yakima Valley with this class of tool. A Brothen automatic level, a new device, manufactured by a gentleman of that name, of Idaho Falls, Idaho, is also in use and it is intended to give a statement as to the value of this level in a future issue of the IRRIGATION AGE.

Why Deserts Bloom

BY DON FARNSWORTH

If public attention is being focused upon any one branch of scientific investigation more than any other in the United States, it is the problem of reclamation of the arid West by irrigation. This unusual interest is full of meaning. It is not the creation of speculators or land dealers but is the result of the natural growth and development of the genius of our country. Homes must be provided for the increasing millions of population; their diversified needs and wants must be supplied in fields of natural production; and hence more land must be brought under cultivation. True to the old proverb, "Necessity is the Mother of American Invention," which is solving by irrigation this great problem inherited from nature.

Irrigation is not a new proposition under experimentation in this country. It is merely the application to our needs, of scientific principles that have been in practical utility from time immemorial. Several nations have used this method of cultivation so long that they consider irrigation as essential a step as seed planting, in the routine of agriculture. Remarkable examples of its operation and evidences of its value are found among the ancient customs of Egypt, India, China and Japan.

The success of the primitive methods of cultivation adopted in these countries in the early ages magnifies the importance of pursuing modern, systematic and scientific methods in our country.

History of irrigation is traced back 3,000 years B. C. when Menes, the first historical King of Egypt, (the cradle of modern civilization), built the city of Memphis on the banks of the Nile. Legend says the people of this time were created by Gods from the dust of the earth—but history tells us they were a branch of the Cushites from Asia or belonged to the Semitic race, descended from the Canaanites. However, they were wise enough to irrigate their lands from the annual overflow of the Nile river, so as to produce two crops a year. The inundation took place about the 28th of July each year—lasting from three to five months. Large ditches were dug into which the water flowed, where it was retained until required to moisten the soil, which became so fertile from a black deposit swept down from the interior, that seed is said to have grown on the surface of the ground. Though nature was a kind nurse in that region and the soil needed little plowing or attention, it is evident that her maternal genius has been somewhat exaggerated by tradition.

The annual rise of the Nile is caused by the early rain-falls in the equatorial regions and the elevated regions drained by the Kir, Solbut and other streams that discharge their waters into the upper Nile. They had an instrument called an Nileometer to record the floods, so as to determine each year how high the river rose and what proportion of the valley was inundated, for there was no rain-fall in the section of Egypt bordering on the lower Nile. Famine was sure to invade such localities as the water failed to reach, and as the farmer planted to raise only enough for his own personal needs, it was essential that his irrigating ditches and ponds should be well supplied with water when the overflow came.

Kinds of Irrigation.—There are as many different systems of irrigation as there are circumstances surrounding its introduction in different localities, each system being designed to supply nature's needs and to overcome her faults. There is the contest against alkali in the soil, involving all methods but removing that element so deadly to all vegetation, a warfare which is a study in itself. There are millions of dollars being expended annually in the irrigation of lands in the humid regions, to improve the already productive soil, for though cultivation without irrigation in these sections is abundantly profitable, the excessive yield due to irrigation pays many times over the expense incurred in the outlay for irrigation.

Reclamation of Waste Land.—By far the most important branch of irrigation, however, is the reclamation

of the arid lands—the conversion of desert wastes into fertile valleys and productive farms. There is rain-fall enough on the earth to make every square foot of land productive. The fact that there are deserts in some sections and fertile valleys in others is due to the unequal distribution of rain-fall, which is essential to all vegetable and animal life. By irrigation, man has outwitted the weather elements, and has made gardens of Eden from land that Nature designed for deserts. He has changed the courses of streams so as to water his farms, and he has built reservoirs to retain water in the seasons of plentiful rain to be used to moisten his parched and thirsty acres during the months of drought. In no land has this artificial agent been so productive of beneficial results as in our own Great West. To a study of irrigation in this area will this article be confined.

History of Irrigation in the United States.—The history of irrigation in the United States is the history of the growth of population. Our forefathers had, east of the Appalachian Mountains, an abundance of natural resources. When the population filled that section of the



Mr. Farnsworth is one of Chicago's successful young business men. He is president of the National Farm Land Congress, president of Farnsworth, Bills & Co., timber lands, vice-president Hough Shade Corporation, Janesville, Wis.; director Osage Oil Company, New York, one of the large independent producing oil companies of Oklahoma. He is manager of Don Farnsworth and associates, which syndicate is one of the most extensive handlers of high grade agricultural lands in the United States, and no doubt the largest advertiser, and is an authority on irrigation and drainage.

Mr. Farnsworth's recreation is civic and commercial work and he was last year general secretary of the Chicago Association of Commerce, of which body he is now chairman of the ways and means committee.

country, pioneers started westward and gradually settled the Ohio and Mississippi Valleys. The westward movement of population is a well-known story in which the settler was the evangel of commerce and industry. The country continued to increase in population, and, as a natural sequence, more territory had to be provided for the growing immigration. A large portion of the great west lay "rainless," and devoid of that element so vital to productivity, until some of the early settlers, driven by necessity, started irrigation in a crude way, found their experiments crowned with success and opened the way for the transformation of almost one-half of the area of the United States, from a desert, to a land of fruitful farms.

EDITOR'S NOTE.—Mr. Farnsworth's comprehensive review of the irrigation field will be continued in several future issues of the AGE.

THE CAREY ACT

How to Acquire Title to Public Lands Under the Act.

A Comprehensive Survey of the Regulations in Force in the Various States.

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IV.

The Water.

As previously stated, the proposal of the "Company" asking for the withdrawal of Lands desired for reclamation, must describe, among other things, "the cost of such works and the price at which they will be sold to those who desire to settle upon the land" and the Statutes further provide that "the works will be sold to the settlers who enter the land, at a price agreed upon with the State. Before the settler may enter the land, he must contract to purchase a share in such works for each acre of land which he desires to enter (In some States one share is apportioned to each 40 acres—Ed.)—each of the shares representing a certain carrying capacity in the canal system, which, in every case, must be sufficient to deliver the water required for the irrigation of his land. The Board shall provide suitable rules for filing proposals," etc.

"The plan adopted for the administration of the works while in the possession of the company, the annual maintenance fee, the system of distribution of water, and all contracts between the company and the settler must be approved by the State Land Board."

"To enable it to carry on its work, the company will be permitted to mortgage its equity in the project but its contract with the State must provide that the settler will be given a proper release from the terms of the mortgage when he has made full payment for his shares."

"There shall be kept at the office for public inspection, copies of all maps, plats and contracts for construction and settlers' entries."

The above is an almost verbatim excerpt from the "Regulations" of the State of Idaho. While the phraseology in the case of the other States varies somewhat, and may differ from this recital, it contains the essence of their regulations upon the subject. The Federal Statutes, of course, are the fundamental Law to which all state legislation and regulation must conform, and space permitting, the regulations of the Department of the Interior, together with the forms prescribed for this procedure, as well as the various forms prescribed by the States, will be presented in a later issue.

So far as the purposes of this article are concerned, an orderly presentation of the various phases of "Water Rights" will, of necessity, begin with the "Contract between the State and the Company," and "Contract between Company and Settler."

Contracts Between States and Companies.

The contracts between the States and the Companies, are not, as a matter of course, in all States, or in all individual cases, so far as the limitations of statutes or regulations permit elasticity, similar. The varying requirements of local conditions do not lend themselves to inflexibility in this regard. It would be clearly impossible in an article of this character, to even attempt to set forth, in detail, the principal recitals of ALL the contracts of this nature, in force and operation at this date. Such a proceeding would, of necessity, be too voluminous and too technical for a work designed for popular reading. The writer will, therefore, confine himself to a detailed discussion of typical contracts operative in the State of Wyoming, to be followed by a less extended reference to the salient features of various contracts in other States, which, for the purpose in view, will prove entirely sufficient.

Typical Contract Between the State of Wyoming and Company.

Preceded by the usual introductory recitals common to all contracts the "Company" being organized under the laws of the State of Wyoming, the State acting through its State Board of Land Commissioners,—there follows the recital of the segregation of the lands "hereinafter described," under the Carey act, recital of water appropriations, of readiness of company to proceed with the construction of the works, and of the delivery of approved bond; it then proceeds to specify as follows, viz:

Clause 1—Agreement of the company to build irrigating system, according to specifications adopted, with reference to list of lands segregated under the Carey act and of other lands, if any, for which company is permitted to furnish water—estimated cost of construction, description of main canal lines and laterals—length of time required for completion of system, carrying capacity of canal, and recital of conditions as to time for completion of stated portions of the work and penalties for unauthorized lapse of work, as prescribed by the regulations. (Recital in all contracts.)

Clause 2—Duty of water (amount to be delivered to settlers—expressed in units) method of delivery of water, and provisions for headgates, etc. (Recital in all contracts.)

Clause 3—Provision for division of irrigation works and water appropriation into shares—1 to each acre of land.

Clause 4—Company reserves exclusive right to dispose of such shares to settlers.

Clause 5—Price of shares. (Water rights.)

Clause 6—Terms of payment for shares.

(Clauses 3 to 6 inclusive—evidence of ownership—whether by "shares," or otherwise, in substance, in all contracts.)

Clause 7—Right of way for company's ditches granted by State across its lands, and across all Carey act lands segregated.

Clause 8—Company permitted to enlarge and extend its system upon approval of Board, for irrigation of other lands, and for power purposes.

Clause 9—Provision for transfer of ownership of canal system to settlers through the instrumentality of a subsidiary "operating" company (or an association).

(Whether by this means, or otherwise, essential recital in all contracts.)

Clause 10—Provision for operation of irrigation works by such operating company, for apportionment of cost of such operation and maintenance; maintenance fee; determination of system for measurement and distribution of water to settlers. (All contracts provide method of operation.)

Clause 11—Definition of the interest represented by shares in the "operating company." The rights of the constructing company which are reserved from disposal, confined to the right to enlarge irrigation works and the right to use water for power purposes. Water rights attached to individual tracts of land and made inseparable therefrom.

Clause 12—Company prohibited from selling water-rights, or "shares," to any but qualified entrymen. (All States.)

Clause 13—Company required to issue to settlers shares in "operating company" at time of purchase, provision for securing interests of company and for the voting power of shares.

Clause 14—Company prohibited from selling "shares" until water ready for delivery to lands to be designated by the land board. Company permitted to sell Contracts for the sale of shares, prior to water being ready, provided all advance payments for water rights be deposited, in escrow, with the State Land Board.

Clause 15—Company permitted to issue bonds, secured by mortgage upon its interest in the system. (All States.)

Clause 16—Company granted the right, when 90 per cent of the shares are sold, at its option, to assign to "operating company," the unsold balance of "shares," free of all claim, and thereupon to be released from further obligation to contribute toward the maintenance

of the system. (Provision for transfer—some method—in all contracts.)

Clause 17—Articles of incorporation of "operating company" and of "Settlers' Associations" taking over the "operating company," must be submitted to State Land Board for approval.

Clause 18—Company agrees to sell "shares" for State lands at a price of \$10.00 per acre less than for contiguous Carey act, lands.

Clause 19—In case all water authorized to be used cannot be applied to the irrigation of the lands described, company is permitted, by and with consent of the State Engineer, to sell such portion of water for municipal and other beneficial purposes.

CONTRACT BETWEEN COMPANY AND SETTLER (IN WYOMING).

Contract No. . . .

..... Company.

AGREEMENT.

"Preamble, reciting names of Parties to Contract and dates—reference to company's contract with the State, to its inauguration of work, recital of water permits issued by the State Engineer, recital naming date when water will be delivered to lands mentioned in contract, that Land Board has authorized company to sell, or contract for the sale of water rights, that the purchaser has applied to the company to purchase the rights specified.

"In consideration of the sum (named) and of the agreements hereinafter contained, it is agreed that the purchaser shall become entitled to shares of stock of the (operating) company, the certificate to be in form as follows, to-wit: "..... (name of operating company), 19..... shares.

"This is to certify that (settler's name) is the owner of shares of the capital stock of the (operating) company."

The certificate recites the fact "that the owner thereof has acquired the right to the use of sufficient water for the irrigation of the lands described, amount of water to be delivered (expressed in acre units), proximity of point of delivery of water to lands (described), to be subject to rules and regulations based upon a system of distribution, subject to the approval of the State Board of Land Commissioners." The certificate also entitles the owner "to a proportionate interest in all the irrigation works, state permits and all rights and franchises of the company, such interest to be based upon the number of shares finally sold, and each share representing such proportionate interest as an acre of irrigable land bears to the total area of irrigable land reclaimed."

"The certificate and the interest it represents cannot be sold separately from the land described. A sale or disposal of the land carries with it this certificate and the interest it represents and the right to the use of water represented cannot be transferred to any other land."

"Said certificate to be delivered as provided in said state contract."

Signatures and attests.

"The water which the purchaser shall have the right to conduct and receive through the said canal system shall be used upon and become dedicated and appurtenant to the following described lands, to-wit: (Description of lands according to government survey), and the parties hereto expressly agree as follows, to-wit:"

(1) "Recital of the fact of the agreement having been made in accordance with the provisions of the 'state contract,' which, with the laws of the state, defines the rights of the respective parties."

(2) "The company agrees that so long as it retains control of the (operating) company—i. e., as long as it continues to vote the majority of the stock of said (operating) company, it will cause the (operating) company to maintain the irrigation system in good order and repair."

"Said operating company is to have power to levy all necessary tolls and assessments upon all purchasers of water rights (whether water is used or not), and the company agrees that no charges shall be made until (a date specified), and that charges shall be limited to (a sum stated—the 'maintenance fee'), payable at office of the (operating) company upon (date named) each year, without notice."

(3) "The consideration for the water rights agreed to be conveyed is the sum of and the balance remaining due after initial payment is payable as follows, to-wit:"

Table of annual payments, extending over period of from ten to twelve years (or the entire amount or any unpaid balance may be paid in full at any time. "Interest from (date named), at 6 per cent per annum, is to be paid annually. "In named), at 6 per cent per annum, is to be paid annually. Interest to be computed at 8 per cent, if not paid within thirty days from date when due. Interest that may have accrued prior to the date of notice given entryman that the company is prepared to furnish water, is waived."

(4) "The purchaser agrees that upon default in any of the payments above specified, or of any annual assessment for the maintenance of the system, the company may declare the entire purchase price due, and may proceed to collect same and to enforce any lien which it may hold upon the water rights or upon the lands, or may, at its option, enforce any remedy given by the laws of Wyoming."

"And the purchaser hereby sets over by mortgage to the company, to secure payment of all amounts due, all interest and all rights now in his possession, or which may accrue to him under his contract with the State for the purchase of the land, and that, immediately upon transfer to him of the legal title to such land, he will execute to the company a mortgage

with power of sale, to secure the performance by him of the provisions of the contract, which mortgage the purchaser agrees shall be a first lien upon the lands, superior to any and every incumbrance in favor of any persons whomsoever."

(5) "The purchaser agrees that the shares of stock purchased in the (operating) company shall be, and are hereby, assigned to the company, which is hereby empowered to vote such stock as it may deem proper at all stockholders' meetings of said (operating) company, until 50 per cent of the purchase price of such stock has been paid."

(6) "It is agreed that no water shall be delivered to purchaser while any installment of principal or interest or any toll or assessment is due and unpaid. Water shall be delivered only during the irrigation season (dates being specified); a domestic supply, when necessary, outside of the irrigation season, shall be delivered under such rules and conditions as shall be determined by the (operating) company."

(7) "This contract may be assigned by the Company, and thereupon the payment of principal and interest, if so provided, shall be payable to the assignee; but the payments for tolls and assessments shall, unless otherwise provided, be paid to the (operating) company, and payment may be enforced by it."

Signatures of parties and witnesses, attests.

Notarial attest.

Blank form of (settlers) assignment of water rights (contingent upon approval of Company).

It is well, to obviate misunderstanding, to dwell again upon the important distinction that the term "Company" in every case refers to the company contracting with the State for the reclamation of the lands, and for the construction of the works necessary, while the "operating company" may be described as a "legal" creation, whose ultimate purpose is to become an instrument for the conveyance of title from the "construction company" to the settler. Although this method affords a convenient means of transfer, it is not to be assumed that it is the rule in all cases of outstanding contracts on segregations already thrown open to entry. In one contract (Colorado) now in force, provision is made for the ultimate transfer of shares of stock in the construction company itself; in another, the contract with the State provides for the incorporation of a "settlers' company," upon the sale of a stipulated percentage of the total of all water rights. In both cases one water right is conveyed with each 40 acres.

The principal features of this contract, are as can readily be inferred, essential to all contracts, regardless of the State,—details of method, such as the transfer of "shares," the injection of the "operating" company, and matters of minor importance may vary, but the objects sought are in every case identical, viz: To vest the settler with the right to the use of sufficient water for his needs, to secure to him his share in the ultimate ownership of the "project," and to assure to the company the payment of the sums due to it.

Other Contracts Between State and Company and Company and Settler.

IDAHO.—Shares in an operating company pass to purchaser at time of application for water rights, and with first payment to the construction company one share with first payment to the construction company, one share to each acre of land, to be held by construction company, as collateral security, until payments are completed.

Interest, at 6 per cent, computed from date mentioned (April 1st or March 1st), contingent upon water being available for such purposes during the irrigation season of the year named in the contract—if not available at that time, then interest to be computed from the date of actual delivery of water.

If water is available at the beginning of the irrigation season of the year named, then deferred payments upon the principal sum become due upon the dates specified in the contract—if there be any delay in the delivery of water then all payments on principal and interest are advanced in time according to the period of such delay.

The company reserves the right to vote the settler's shares in the operating company until 35 per cent of the purchase price of such shares has been paid.

COLORADO.—Use of water restricted to irrigation and domestic purposes.

Water may not be allowed to run to waste.

The company reserves the right to formulate rules for the delivery of water, and the right to arbitration and final decision in case of disputes between settlers.

The company disavows all responsibility for dam-

(Continued on page 222.)

Underflow Problem Solved in the Arkansas Valley

CIMARRON, KANSAS

Cimarron, Kansas, thirty miles from Garden City, is about to attract the attention of irrigationists and settlers all over America.

Since the government pumping stations were erected at Garden City, that place has been known as practically the only irrigation district in Kansas. Across the Colorado line in the Arkansas Valley, irrigation towns are the rule rather than the exception. Since the time of the construction of the Fort Lyon Canal, twenty years ago, many other ventures have followed and one by one the attention of the country has been turned to Canon

Arkansas and get irrigation. After the completion of the ditch, however, owing to faulty construction of head-gates and other details not well understood at that time, the proposition was dropped and the long ditch has for years been known as "Soule's Folly." Cimarron went ahead, however, making a fortune out of dry farming, and despite the lack of irrigation, has grown in wealth from year to year. The accompanying photograph shows Cimarron on a Saturday afternoon. The easterner will be surprised at the number of automobiles, etc., in a town of this size, but the westerner realizes the immense



Cimarron, Kansas, on a Saturday Afternoon.

City, Florence, Rocky Ford, La Junta, Las Animas, Lamar, Holly, etc. Then came Garden City and now we have Cimarron, all located in the thriving and well irrigated Arkansas Valley.

But Cimarron was for years a prosperous town without irrigation. Nearly a quarter of a century ago, A. T. Soule, a New York millionaire, came into Kansas at the solicitation of the Gilbert brothers and started a ditch ninety-six miles long, proposing to tap the waters of the

amount of success that has attended the Kansas farmer in recent years.

And now comes the project which is destined to make Cimarron as well known as some of the old irrigation districts and the construction is of particular interest to the irrigationist. The question of solving the methods of securing the underflow has been and is now one of the most important questions before western homebuilders.

Gilbert brothers, who in the early eighties had inter-

ested Soule, not being dismayed by the fact that the project was abandoned, and knowing that the soil of Gray county is as fertile as any in the world, bided their time until the country should awake to the great importance of irrigated land. Finally, John A. Traylor of the Traylor Machinery Company of Denver, Colorado, became interested and carefully investigated the conditions that were bringing success at Garden City. Thinking he had discovered a way to bring success where Soule had made a failure, he interested with him Honorable John Barnett, Attorney General of Colorado, A. M. Eppstein, the well-known Denver millionaire, and S. F. Dutton of the Albany. They organized a company and, securing additional capital, started to work. The canal had been called the Eureka Canal. More than \$1,000,000 had been spent on the ditch, but they acquired the ownership of the property from the London, England, bond holders, through Eugene F. Ware, who represented them, and began to carry out their plans.

Under the ditch are the towns of Ingalls, Cimarron, Dodge City and Spearville. As constructed, the old ditch could have reached 200,000 acres and had a carrying capacity of that much. The ditch broadens out at Ingalls, climbs the divide past Cimarron putting all the rich, valley land contiguous to Cimarron, under water.

Mr. Traylor came to examine the property in January, 1909, and made a report on it as engineer and a few months later bought it, interesting with him the above named gentlemen. Instead of tapping the river, which had been tried before, he proposed to them the question of recovering the underflow of the Arkansas River first and afterward to store the flood water of the Arkansas in reservoirs.

Sites for such reservoirs are available at various points. The result of his study showed that underlying the Arkansas River proper as far as the Kansas-Colorado line is a water bearing zone principally of coarse gravel reaching fifty feet in depth at Coolidge on the Kansas-Colorado line. The service of the river has a fall of six feet to the mile at Garden City, and the water bearing zone has a thickness of 300 feet, while fifty miles further east of Dodge City, the thickness is only ninety feet, creating thus a deep pocket at Garden City. By tests, the water bearing zone was found to extend north and south of the river to a varying distance of from five to fifteen miles. The gravel making up the ancient river bed was also found by actual test to hold forty per cent of water. This water flows in a constant current eastward following the main course of the Arkansas River. From the logs of various wells up the valley, it was found that there were small kidneys or islands of clay interspersing the gravel up and down the valley, but by actual borings at a point just west of Ingalls there was found five miles of nothing but gravel.

The new company incorporated as the Arkansas Valley Irrigation Company, started at that point to recover the under-flow. The success of the government wells at Garden City has proven that at least one-fourth of a gallon per square foot of percolating area under one foot head of water can be obtained and be depended upon as a constant flow. This and more has proven to be the fact at Cimarron. In fact a sub-current has been proven to flow as freely but not as rapidly as the current in the bottom of the river.

As a result of these peculiar conditions ruling at this particular place only, the idea was conceived of constructing a sump or gathering channel of such proportions that it might catch all the under-flow flowing down the Arkansas Valley which would be sufficient in a normal flow to take care of 30,000 acres of land. At the same time the government records of the water passing Ingalls each year show an average of 1,000,000 acre feet of water going to waste annually.

Right here it is well to note the apparently impossible fact that about four times as much water is taken out of the Arkansas River now every year and used for irrigation as flows at any place in the Arkansas at any time. This is of course because of the fact that it nearly all seeps back into the channel again.

The construction company subsequently filed on the water rights and is now constructing reservoirs of sufficient capacity to take care of 50,000 acres extending as

far as Spearville forty miles east of the intake of the canal. The difference between this project and others lies in the method of securing the under-flow. Instead of constructing an expensive pumping system, the engineers after the most complete investigations recommended the construction of a sump that would gather and collect the water and feed it to the canal by gravity. This was quite possible as, commencing at the intake of the canal and for a considerable distance up the valley, the river has a straight fall of eight feet to the mile. The canal was constructed with only a drop of one foot to the mile and runs parallel to the river on the north side distant from the same only a few hundred feet to a point where it approximated eight feet below the level of the river opposite or the local level of water in the valley. At that point the construction of the gathering channel was begun.

The sump has now been constructed several thousand feet and is producing on an average eight times the amount of water the engineers originally planned to receive. Engineers contend that this shows the beginning of the largest proposition of its kind ever known. One needs to imagine a trench or canal which on its bottom grade has a width of sixty feet standing at all times six feet deep in water, with an eighty-foot width on the surface, the bottom extended on a level, thereby gaining eight feet in depth per mile length to a total length of five miles, to appreciate this. This sump, therefore, has a width of sixty feet on its bottom at the beginning and gradually reaches a total surface width of 110 feet, being the natural slope for excavation. At the upper end or terminus it will have a width of sixty feet on the bottom and a depth of 58 feet from the surface and a width on the surface of 225 feet.

This sump has been constructed 3,000 feet so far and is being constructed purely as a water selling corporation with no stock for sale.

The country is a natural wheat, corn and alfalfa community with eight months of actual growing season and a warm, temperate summer climate. The soil may be classed as alluvial, being made up wholly by successive deposits from the Arkansas River. A sand and gravel bed extends both north and south holding almost on a level with the channel of the river. Above this lies the rich, loamy soils of Gray and Ford counties on the north side of the river. The soil varies from ten to 100 feet in depth and is almost wholly gypsum in one form or another. No alkali or indications of alkali are found anywhere.

At this time the old canal is cleaned and has water flowing in it to within three miles of Dodge City, and the scraper gangs are commencing the work for completion of the canal to a few miles east of Dodge City. No water is offered except as developed. A perpetual water right entitling the holder to sufficient water costs \$40 on twenty-year terms. Lands can be bought under this system at a reasonable price, depending upon their location and nearness at present to Cimarron.

Alfalfa has been proven to produce eight tons to the acre, grain sixty to ninety bushels to the acre; wheat from forty to sixty bushels per acre. The future of Cimarron lies not only in these crops but in truck farming. Cimarron is on the main line of the ditch. The town is located on the main line of the Santa Fe Railroad with eight trains per day stopping there. The altitude is 2,400 feet. It possesses two grain elevators. The cattle ranches succumbed to farming six or seven years ago.

Cimarron itself is now thirty years old and has about 1,000 population, the majority of which have arrived within the last few years. The place is naturally prepared for a rapid growth to meet the influx of settlers, land buyers and business men who will be attracted by the unusual opportunity. It is just 375 miles to the market centers of Kansas City or in the opposite direction, Denver.

A new commercial club has been organized at Cimarron with C. R. Rixon as president, and E. T. Peterson as secretary, and preparations are being made to meet the new and altered conditions which will soon prevail.

There is so much interest about this unusual proposition and about Cimarron itself that this article will be continued from time to time covering the whole subject in detail.

Notes on Practical Irrigation

D. H. Anderson

ALKALI SOILS.

Their Nature, Treatment, and Reclamation.

The "alkalis," as they are called, are common to all soils wherever they may be found on the globe; they belong to earth and are part of its essential constituents.

Originally, they were brought or carried into the soil along with the other elements which form its inorganic bulk (as has been explained in Chapter II), by the pulverization of rocks and minerals, the deposition of inorganic sediment held in solution by water, by glacial action, by seepage from rivers, and numerous other ways.

These elements, if unacted upon, would forever remain in an insoluble, inert condition, incapable of exerting any influence upon each other, or of performing any functions whatever; in which case, however, there could not be any plant life of any kind. But nature comes in and begins action upon these elements and changes their form so that they may become capable of aiding in the production of plants by furnishing them with the food to make them grow and ripen their fruit or seed.

First, we have the atmosphere, or air, which, however arid the region, contains oxygen in a very large proportion, and this oxygen attacks the inorganic elements, transforming them into various substances, or rather fits them to be acted upon by other substances so that they may become useful or otherwise. Thus, oxygen acts upon potash, soda, lime and magnesia to form what are known as "alkaline bases," that is, the foundations for the "salts," which are beneficial in moderate quantities but injurious in excess. The forces of nature are always at work, regardless of the quantity of the product; certain laws are followed, and these laws keep on operating in certain unvarying ways, according to a fixed program, which is never changed unless man comes in and compels a change. The following table will enable the reader to understand in a general way how nature works upon the elements in the soil through oxygen:

Oxygen.

Unites with Potassium and forms Potash.

Unites with Sodium and forms Soda.

Unites with Calcium and forms Lime.

Unites with Magnesium and forms Magnesia.

The oxygen acts upon the above four metals just as it does on iron exposed to the air, when it forms the familiarly known "rust," which is technically called "oxide of iron." So the potash, soda, lime and magnesia are really the earth oxides, the four of them being "alkaline bases," that is, the foundations upon which to compound all the various kinds of alkalis.

These "oxides," or "bases," in themselves, would be of very little use or harm while in that state, but the oxygen in the air and everywhere else attacks the other essential elements in the soil as well as the potash, soda, lime and magnesia, that is, the silicon, carbon, sulphur and phosphorus, but instead of converting them into oxides, or alkaline bases, turns them into "acids." The following table will explain:

Unites with Silicon and forms Silicic Acid.

Unites with Carbon and forms Carbonic Acid.

Unites with Sulphur and forms Sulphuric Acid.

Unites with Phosphorus and forms Phosphoric Acid.

Here is where the whole trouble about alkali soils begins, for these acids mentioned in the last table, which may be called mineral, or metallic, acids, have a great affinity for the alkaline bases mentioned in the first table, and greedily seize upon them, forming "salts," as they

are commonly called. When these mineral acids attack the alkaline bases, this is what happens:

Silicic Acid forms Silicate of Potash, Soda, Lime and Magnesia.

Carbonic Acid forms Carbonate of Potash, Soda, Lime and Magnesia.

Sulphuric Acid forms Sulphate of Potash, Soda, Lime and Magnesia.

Phosphoric Acid forms Phosphate of Potash, Soda, Lime and Magnesia.

It is the carbonate of soda, or what is commonly called "sal soda," which makes "black alkali land," and sulphate of soda, or "Glauber salt," which constitutes "white alkali land." There are numerous other salts formed by combining the alkaline bases and the mineral acids, but sufficient are given here to make the principle clear; to enumerate the others would require a volume, and complicate too much the idea sought to be conveyed in this work. Moreover their action is the same as the sodas, though in a much less harmful degree.

So far, water has been kept in the background, as unnecessary to the formation of these salts, but when water is brought in the distribution of these alkaline salts is largely aided, for the alkalis are extremely soluble in water, the latter taking up nearly its own weight of the salts. When this happens, the alkalis are carried wherever the water penetrates, and when it comes to the surface it evaporates into the atmosphere, but leaves the alkali salts behind to accumulate, until the soil is ruined for purposes of vegetation unless they are removed, or got rid of in some way and the soil thus "reclaimed," as it is called.

In this inorganic matter, plant life is impossible. As has already been said, organic matter in combination with the inorganic matter, is essential to plants of any kind, and here originates a phenomenon as common as the continual process of the formation of alkalis by combinations with the mineral, or metallic acids, as above specified. Organic matter also combines to form acids which are called "vegetable acids," and they also readily combine with the alkaline bases, the result of which is mutual destruction. This will be understood from a single experiment that any reader can try.

Vinegar is the most commonly known vegetable acid, the technical name of which is "acetic acid," it being formed during the germination of seeds in the ground, as will be explained in the chapter on Plant Foods. The plant forms it within its tissues and then rejects it for the purpose of permitting it to continue dissolving the earthly substances with which it is in contact. It is also formed artificially for domestic use. Now this vinegar is the natural enemy of the alkalis. When poured upon any of the alkalis of potash, soda, or magnesia, it causes a hissing or effervescence. When this ceases, there is left neither an alkali nor acid, both have disappeared, and their substances are totally changed into something else. A new salt called an "acetate," which is neither one thing or the other; they have mutually destroyed each other.

These acetates are not noxious to plants, and appear to be freely created by the plant itself during the process of developing acetic acid, which is essential for the purpose of transforming starch into sugar, whether of the cane or grape variety, and for laying the foundation of woody fiber and cellular tissues, all of which, alkali tends to prevent if in excess. It is well known from actual experience that sugar bearing plants, such as sorghum, sugar beets and trees of abundant starch and woody fiber will flourish luxuriantly in alkali soils that will not even permit the germination of cereals, or alfalfa. The reason why this is so is not far to seek, and when well understood the partial reclamation of alkali lands, even under adverse conditions, may be attained, and wholly so where the conditions are opposed to the accumulations of alkali from artificial sources.

Dangerous Percentage of Alkali.

There is much controversy about the dangerous amount of alkalis in arable soils, but the entire question may be resolved into four divisions:

First—Soils naturally so heavily charged with alkali as to be worthless.

Second—Soils in which the alkali is increased by fortuitous or artificial means.

Third—Alkali soils suitable for general crops.

Fourth—Alkali soils adapted only to certain special classes of plants.

The sodas are the most dangerous of the alkalis, both the carbonate, or "sal soda," which is the cause of "black alkali land," and the sulphate, or "Glauber salts," which is the deposit on most of the "white alkali lands," because they are so very easily soluble in water, whereas the sulphate of lime, or "gypsum," and all the other sulphates, and the phosphates, are very much less soluble in water. The consequence is, the soda alkalis are always shifting their location, always following the water, because the latter takes them up greedily whenever they are brought in contact, whether on the surface or in the subsoil, or under the influence of seepage which carries the alkalis from a higher to a lower level. The tendency of water when in motion, or flowing, is first downward, it leaches, or percolates through the soil, but after it has become stationary, that is, when it does not find an outlet through drainage, either natural or artificial, it begins an upward movement toward the surface through capillary action, and carries with it the alkalis it contains in solution, evaporates and leaves the salts on the surface. It is not difficult to understand how the alkalis accumulate in the soil, the difficulty begins when the attempt is made to remove them and fit the soil for plant life.

As the amount of alkali deposited in the soil increases, the number of species or varieties of plants decreases. Where soils are charged with an excess of alkalis by fortuitous or artificial means, the reader will understand that the excess has been added to the natural supply by the flooding of rains, or by irrigation. The alkali has not been washed out of the soil by the water, it has been carried into it by water charged with the soluble salts, directly, or by seepage from irrigating ditches. In either case, deep cultivation, surface, or sub-drainage, will tend to restore the soil to its normal condition. Moreover, it is not difficult to wash out of the soil the elements necessary to plant life through the application of water, and, inasmuch as the alkalis are more soluble than any of the plant foods, it should be less difficult to eliminate the former by the same process that carried them into the soil, intelligently applied.

One per cent of alkali salts in an average soil one foot deep equals 40,946 pounds dry, and 55,146 pounds wet, too great a quantity for the successful growth of cereals, although the soil may be very rich in all the other plant foods, which is generally the case in all alkali soils, and this percentage will prevent the growth of trees, bushes, vines and root crops in general. Sometimes the alkali is near the surface, in the first two inches of it! indeed, the tendency of the alkalis is toward the surface, in this case the one per cent of alkali would mean a weight of the salts in a foot deep acre of only about 6,824 pounds dry, or 9,191 pounds wet, a quantity not in excess if distributed uniformly through the soil. But lying at the immediate surface, the cereal grains cannot germinate, or if they do the young and tender plants perish from thirst, literally, the alkalis absorbing all the water around them, although there may be plenty of untainted water in the subsoil, in which case deep plowing and turning the soil over will furnish a top soil in which the seeds may germinate and reach a growth able to resist the alkali turned under. In fact, the roots of the plant will reach beyond the alkali, for the latter will then have again sought the surface, where it can do no harm.

Alfalfa, for instance, will grow in a moderately alkaline soil, because the long tap roots penetrate to the subsoil depths, where there is less alkali. Moreover, the thick growth and luxuriant foliage shade the ground and prevent evaporation, which is the handmaid of alkali deposits.

All soils showing less than one-fifth of one per cent of alkali salts, that is, less than 9,000 pounds to the foot acre dry, or 12,000 pounds wet, may be considered safe for all kinds of crops, and there will never be any danger from excess of alkalis, so long as good water is used and the land well drained and cultivated. When the alkali goes beyond one-fifth to two-fifths per cent, general crops fail, as a rule, and spots begin to show when cultivated. And when the alkali reaches four-tenths and six-

tenths of one per cent, while general crops will not grow, sweet clover and the common run of fleshy, scented and sugary plants will grow and produce large crops, but must be harvested early in the case of forage plants, as has already been said, else they will become bitter and uneatable.

There are, as has been said, about 197 species of plants which possess a great affinity for alkali and will luxuriate in masses of it where all other vegetation fails to gain a foothold. Thus, greasewood, or creosote bush, will flourish in a soil containing 194,760 pounds of alkali salts per acre one foot deep, which is more than four per cent of alkali. Scrub salt bush will grow in soil containing 78,240 pounds per acre, equal to about one and one-half per cent. Samphire luxuriates in soil containing 306,000 pounds of alkali per acre, or about six per cent. Wheat, however, will not grow where the soil contains a total of 20,520 pounds of the sulphates, carbonates, chlorides and nitrates of soda and potash per acre one foot deep, which is less than one-half of one per cent of the weight of the soil.

Attempts at Reclamation.

It is impossible to establish any rule or set of rules for the adaptation of alkali lands to profitable crops. The natural growth of numerous varieties and species of plants on strong alkalis is of very little moment to the farmer, his main inquiry being: "How shall I get rid of the excess of alkali? The whole object of cultivating the soil is to compel it to produce something useful as well as profitable, otherwise it is labor lost to put a plow in the ground. But in the arid and semi-arid lands the soil may be exceedingly fertile for general crops, and after cultivation and irrigation may become so impregnated with alkali as to lose that fertility in spite of the quantities of essential plant food still in the soil.

Where this calamity overtakes the farmer he can not very well wander about and take up a new location on fresh land and again go through the same experience. He must remain rooted to the soil, so to speak, and use all the information he can gather to restore his land to its normal condition, or so much of it as has gone wrong. It is a well-known saying: "All signs fail in dry weather," and there are several others equally as apt. Some say: "It is useless to pray for rain with the wind from the wrong quarter," or, "It is a dry moon, and the barns up won't let the water out." In the case of alkali soils there are no apt sayings, but there ought to be one, and a very good one seems to be: "Alkali laughs at the established methods of cultivating the soil."

When crops begin to look "sick," and black or white patches appear here and there, the reason is not far to seek: alkali is at work. The subsoil may be alkaline; there may be a stratum of hard pan which prevents the water with its solution of alkalis from leaching down through beyond the reach of the roots; the irrigation water may contain a large percentage of alkali in solution, and, coming to the surface, carry its alkali along with it; there may be an irrigation ditch above and beyond, or a stream, or reservoir, from which the water seeps and comes up wherever it can find an outlet. In all these cases, and there are many others, except where the soil is naturally strongly alkaline, he looks for the cause, and he finds it in fortuitous or accidental additions of alkali. Excess of alkali has been carried into the soil, and he first stops any further arrivals. The beginning of a remedy is the same in the case of a thousand or more acres as in the case of but one, there is merely a difference in extent of operations. Then the alkali having got into the soil, he quite naturally thinks that it may be got out in the same way it got in. This is true as to methods. It drains or seeps in; let it drain and seep out. It came to the surface with the water through capillary action, therefore let that capillary action be stopped or impeded. The water from the subsoil evaporating at the surface left the alkalis behind to interfere with plant life, hence, if that evaporation be prevented or reduced, there will be no more, or, at least, less surface deposits.

Without stopping to consider drainage, which requires a chapter of its own, there are two conditions or processes which are keys that nearly fit the situation: cultivation and rotation of crops.

Cultivation serves a double purpose; that of breaking

(Continued on page 220.)

Irrigation of Alfalfa

By SAMUEL FORTIER,

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Methods of Irrigating Alfalfa.

The methods of applying water to alfalfa differ widely because of diversity in soils and subsoils, in climate and topography, in the nature of the water supply, the size of the farm, the amount of money available for preparing the land for water, the prevailing crops grown, and the early training and environment of the irrigator. The standard methods have been grouped under the following heads, namely, the border method, the check method, flooding from field laterals, furrow irrigation, and other less common methods, with various modifications of each.

In passing it may be said that the usual order is to locate and build the farm ditches first and prepare the land afterwards. In this bulletin it has been deemed best to describe the methods in use and then to consider the location and construction of farm ditches. After one has a general knowledge of the various ways of applying water and of the size and character of the ditches required for each method he is in a better position to understand the proper methods to adopt in building farm ditches. This subject will therefore be treated separately under its own heading.

The Border Method.

Essentially the border method consists of the division of a field or tract into long, narrow strips or lands by low flat levees which usually extend in the direction of the steepest slope and confine the water to a single strip. The bed of each strip is carefully graded to a uniform slope, although the slope may change to conform to the contour of the natural surface. The water to irrigate each strip is taken from the head ditch extending across the upper edge of the field, and is controlled by an outlet box or border gate, although the gates are sometimes omitted to save in first cost of preparing for irrigation. Check gates, canvas dams, or metal tappoons are used to hold up the water in the head ditch to cause it to flow into the borders.

This method is confined chiefly to the irrigation of alfalfa and grain, and in its various modifications is used extensively in Arizona, California, and, to a less extent, in Idaho, Montana, and other Rocky Mountain States. It can be used best under canals which deliver water to users in large streams, since the smallest head that can be applied successfully is seldom less than 2 or 3 cubic feet per second, but heads of 5 to 10 cubic feet per second are the rule. It is adapted especially to light, open soils, into which water percolates rapidly, as the use of a large stream confined between borders makes it possible to force water over the surface without great loss by percolation.

On the university farm at Davis, Cal., the borders or lands average about 50 feet wide by 900 feet long. Each levee has a base 7 feet wide and is 12 inches high, when newly made, but settles to about 10 inches before the first crop is harvested. The bed of each strip is leveled cross-wise and slopes regularly from top to bottom. In preparing the surface of this field, the barley stubble was burned, then the soil was disked and roughly graded. The location of each border was marked out either by a drag or by making a furrow. Sufficient earth to form the border was obtained by skimming the surface with scrapers. The scraper teams began next to the head ditch and worked

down. They crossed and recrossed the field at right angles to the borders, and as a scraper passed a border marking it was dumped. Each scraper width of the borders was made up of two loads, but the last load overlapped the first by half the width of the scraper. The surface of each border was then leveled to within 0.1 or 0.2 foot of accuracy. The levees when first built were rough, irregular, and steep. They were cut down to a uniform grade by a homemade device called a planer, shown in figure 3.

In Imperial Valley, California, a 40-acre tract is divided in 22 lands each 60 feet wide and 0.25 mile long. When the slope is too steep the lands run diagonally across the tract. In order to lessen the first cost the material for the borders, instead of being scraped from the high portions of the lands, is taken from the sides of the borders. This creates hollows in which water may collect, makes the mowing and raking more difficult, and frequently lessens the yield. Such borders may be made

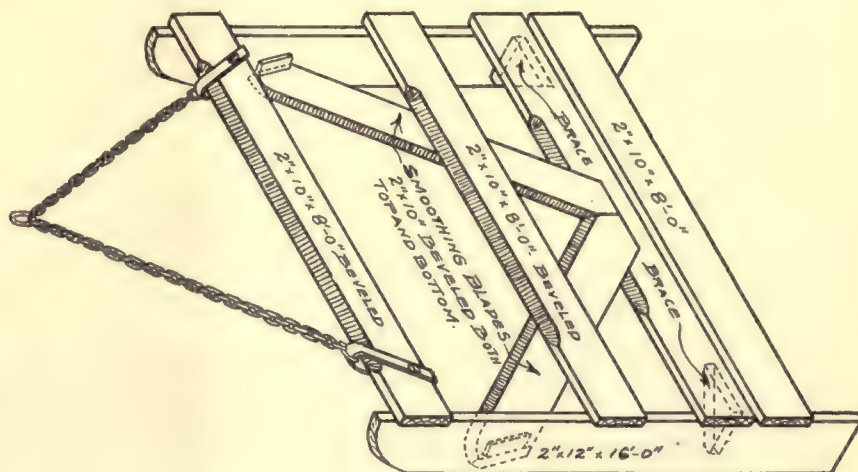


Fig. 3.—Levee Smoother Made by H. I. Moore.

by the use of the plow and ridger (fig. 4). In this method a narrow strip is first plowed and then the ridger, drawn by a number of horses, forms the loose earth into a ridge. The cost per acre for preparing the land by the border method in this valley varies all the way from \$5 to \$20, depending on the character of the native vegetation and the size and number of the hummocks. When creosote

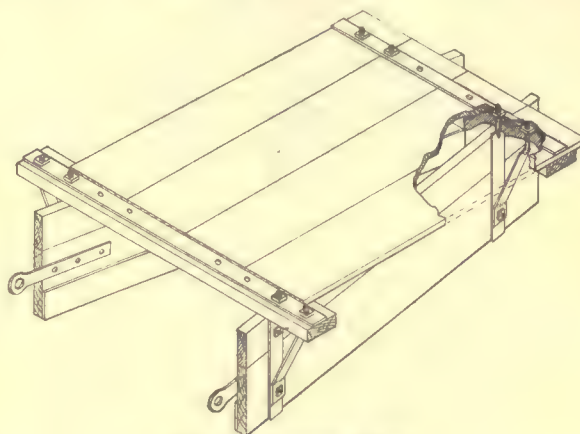


Fig. 4.—Adjustable Ridger.

bushes and mesquite trees are surrounded by wind-driven sands, the cost may run as high as \$40 per acre.

In Salt River Valley, Arizona, the customary method of preparing the land for alfalfa is to remove the brush, plow the high places, and roughly level the surface with suitable scrapers. Then the borders are marked off from 30 to 50 feet apart. The spacing depends on the porosity of the soil, the configuration of the land, and the head

of water available. After forming rough borders by means of four plow furrows thrown together to form a ridge, a disk or spring-tooth harrow is run lengthwise of the lands. The borders are then crowded with a V crowder and usually a leveler is run transversely to the borders to round them off. The land then receives a heavy irrigation and when dry enough to work is again disked or harrowed and seeded. Such borders when first made have a base of about 3 feet and a height of 1 foot, which settles to about 9 inches. The length of the borders or lands varies from one-eighth to one-fourth mile.

The farmers on the Roswell Bench on the south side of the Boise River in Idaho make the levees 66 feet apart and 300 to 1,300 feet long, depending chiefly on the topography of the land. The land is first leveled with scrapers, then plowed and harrowed, after which the borders are marked off and thrown up by plowing two to four furrows with a heavy plow. Before seeding, a home-made planer is dragged lengthwise and crosswise of the lands in order to fill up the hollows by cutting off the high places. The cost of preparing land in this way and seeding varies from \$10 to \$30 per acre, depending upon the roughness of the surface.

One of the great advantages of this method is that it enables one man to use a large stream of water and irrigate a large area with a minimum of labor. The size of streams used in the Rillito Valley in Arizona varies. A head of about 100 miner's inches is turned into a plat of land 30 feet wide, and takes one to three hours to reach the lower end, 660 feet distant. Two men working twelve hours each, with this head of water, will irrigate

50 to 600 miner's inches. In using a head of 500 inches it is customary to divide it among five lands. With such a head it is not unusual for two men working twelve-hour shifts to irrigate 80 acres in twenty-four hours.

(Continued in April Issue.)

IDAHO LAWS GIVE SECURITY.

Engineer Eagleson Approves State Plan for Handling Its Resources.

Idaho is today looked upon as the model state in the matter of handling its natural resources and it has the best irrigation laws yet devised, giving absolute security to both the home-builder and the capitalist, is the belief of E. G. Eagleson of Boise, formerly surveyor general of Idaho, as expressed at a recent meeting of civil engineers of the state when the Idaho Society of Engineers was organized. Mr. Eagleson's remarks attracted great attention from engineers interested in irrigation. After summarizing the history of irrigation throughout the world from ancient to modern times, he said in part:

"At the present time there are about 100,000,000 acres of land irrigated in the world, and about 16 per cent of that amount is in the United States. It is estimated that about 60,000,000 acres can be reclaimed in the United States at moderate cost. However, increased population, higher land values, cheaper materials, higher duties of water and more efficient devices will undoubtedly increase this amount in a few years to at least 75,000,000 acres, and possibly to 100,000,000 acres.

"Of all the arid states and territories, Idaho will probably reclaim more acres by irrigation than any other. It is estimated that about 6,500,000 acres can be reclaimed in the state, which is about 11 per cent of all the irrigable lands in the United States that can be reclaimed at moderate cost. About 5,000,000 acres of Idaho lands lie in the Snake River basin above the Huntington Canyon, and now support nearly 200,000 population. Egypt irrigates practically the same area and supports upon it 7,000,000 people, an average of nine hundred to the square mile. In irrigated Italy, the population averages 800 to the square mile, while in India as many as 1,200 subsist on the products of 640 acres. All these countries are poorly supplied with timber, fuel, mineral, forage and water power, while Idaho has more than its share of these natural resources in and adjoining its irrigated areas. But counting for Idaho a family of four to each 10-acre tract, her irrigated area will have a population of more than 2,500,000 inside of thirty years. All this seems more than probable if the rapid manner in which Idaho lands are being appropriated under the various United States laws.

"Since the granting of the first Carey act segregation about ten years ago, there have been appropriated under this law 2,478,856 acres, the reclamation of which is estimated to cost \$67,750,000. Private enterprises are reclaiming 139,000 acres at an estimated cost of \$2,780,000. Eleven irrigation districts are improving and extending their systems to embrace 346,000 acres, a large part of which was desert, at an estimated cost of \$1,730,000, making a grand total of \$72,260,000 being expended under authority of the state.

"The withdrawals under the United States reclamation act for the Minidoka and Payette-Boise projects amount to 480,000 acres, the reclamation of which is estimated to cost something over \$13,000,000. Perhaps 20 per cent of all this work in the state has been completed and the total expenditure on all irrigation projects of the state amounts to about \$30,000,000.

"Idaho is today looked upon as the model state in the matter of handling its resources. It has the best irrigation laws yet devised, giving absolute security to both the home-builder and the capitalist. Not a bond or water contract has ever failed to be paid and no home has ever been lost on an Idaho project through any unfair exaction of the capitalist or failure of the law. Capital is invited to come here and its stay is so protected that it deals fairly and satisfactorily with the people."

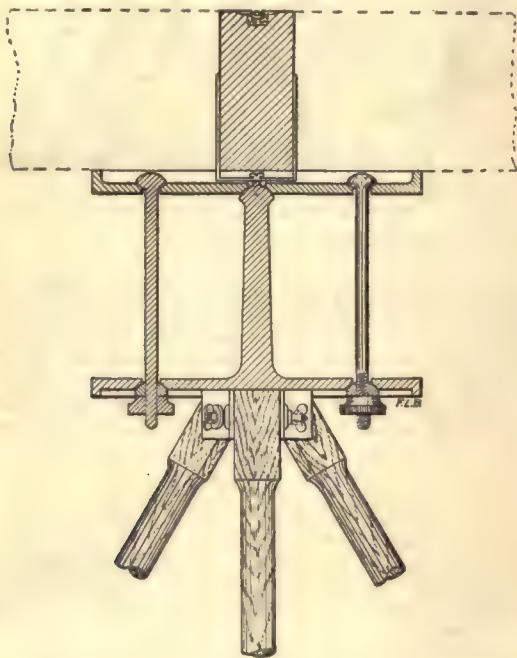


Fig. 5.—Carpenter's Spirit Level Attached to a Tripod.

in twenty-four hours 12 to 15 acres, at a cost of 20 to 25 cents per acre for each watering. In the extensive alfalfa fields belonging to the Butterfield Live Stock Company, of Weiser, Idaho, the head ditch has a capacity of 150 to 500 miner's inches, divided into three or four streams, and permitted to flow down as many lands until the soil is moistened to a depth of several feet. Each field receives three such waterings in a season. On the alfalfa fields in Yolo County, Cal., the natural slope of the land is about 1 foot in 400. On the shorter lands the head used is seldom less than 6 cubic feet per second, but three and four times this quantity is often applied to the longer lands. On fields well laid off, with good border gates and border levees, two men can irrigate 20 to 40 acres in twelve hours, the area within these limits depending chiefly on the size of the irrigating head. In Imperial Valley, California, the size of the head used varies from

Success in Underflow Pumping

Experiments Near Denver Prove Satisfactory and Open Wide Field for Reclamation Work.

A Colorado banker's prophecy is about to come true:

Six years or more ago Mr. Gordon Jones, one of the leading bankers of Denver, made the statement in a public address that the time was then not far distant when the lands in Eastern Colorado, at that time devoted principally to stock raising, would be cut up into small tracts, each tract being irrigated and cultivated to the highest state of perfection by the up-to-date scientific farmer.

This prophecy, given as a result of keen foresight based on a practical knowledge of existing conditions, is about to be fulfilled. For months experiments have been conducted in Eastern Colorado by a company of Denver business men. These experiments have had to do with the bringing to the surface of the underground waters in order to utilize them for irrigation purposes. True, under-



View of engine house and flume, showing distance water is lifted above the ground before being deposited in the flume.

flow waters found in other parts of the country have been harnessed and put to good use, but in Colorado this work is new.

About a year ago the question was first agitated among Denver business men. The responses were few, but finally enough men were interested in order to undertake the experimental work. This work was commenced in May of last year in the Bijou Valley in Elbert County, Colorado, the center of the region known as the "dry farming" section.

In Eastern Colorado the rainfall averages from 14 to 17 and probably 20 inches per year. This amount of moisture is insufficient, however, for growing crops. It means that each year thousands and even millions of acre feet of water fall on this land and is allowed to go absolutely to waste. In fact, a former State engineer says that for the district east of Pueblo in the region of the Arkansas River 27,000,000 acre feet of water go to waste each year.

These Eastern Colorado lands are traversed by numerous creeks, varying in size, but practically all dry streams eleven months out of the year. Investigations have, however, shown that these creeks, although dry on the surface, are veritable living streams underneath the sand beds. This is due to the peculiar formation of the country. The fall along all of these streams is rapid and the water runs quickly off the land, gathering in the creeks and gullies. Here the surface formation is sand, varying in depth from three to ten or fifteen feet. Through

this the water sinks rapidly until it strikes a bed of gravel. This gravel rests on top of what is known as the "first hardpan." This may be a bed of shale rock or merely a layer of blue clay, "hydraulic cement" as engineers sometimes term it, but at any rate it is impervious to water and here is found the living waters of the dry creeks of Eastern Colorado.

How best to reach this water, how to lift it onto the ground, how to construct the wells necessary, are problems now being solved, and in the interesting work now going on these questions are being answered.

The first work in the Bijou Valley, where conditions exist similar to those that must be solved in all parts of Eastern Colorado, consisted in the digging of a large well or sump. Work was commenced along east Bijou Creek, the hole being dug about 50 feet from the creek



View of ditch about 1,000 feet from pumping plant.

bed. Plow and scraper were used as the excavation opened was not less than a large hole, ten feet wide and thirty-feet long. "Keep at it 'til you reach water," were the orders. This was done. Clay soil was encountered in the first two feet of digging. Then came sand and four feet further, or at a depth of six feet from the surface the first water was encountered.

How to hold back the sand was now the question. Tests were made which showed that about six feet of sand must be conquered before the gravel could be reached. It was then decided to sink perforated pipes and pump through these. This was done, two 6-inch pipes being sunk to bed rock, which at this point was found to be about twenty feet from the surface.

Connections were then made and water brought to the surface in sufficient quantities to indicate the presence of the underflow waters. In this pumping a 6-inch centrifugal pump and 12 H. P. gasoline engine were used. While the

results attained were in a measure satisfactory, still a flow of only 300 gallons a minute could be obtained. To increase this meant the sinking of additional pipes. This, it was found, would only add to the friction that would



Water flowing from discharge pipe of pump. This flow, through a 10-inch discharge pipe, is 800 gallons per minute. This flow in summer, when cold will not retard it, is about 1,100 gallons per minute.

have to be contended with in lifting the water, and so it was decided to sink an open well, cribbing it in order to hold back the sand. Wooden cribbing was first tried, but

this was found to be useless and a concrete was used instead. A well 12 feet in diameter, with a concrete cribbing one foot thick, reinforced, was then sunk into the gravel and through the quick-sand. This work resulted successfully in holding back the sands. The major part of the water, it was found, came up through the bottom of the sump. By means of small pieces of wood, specially grooved and set in the concrete, openings were left in the walls of the cribbing so that water could flow in from the sides, as well as come up through the bottom.

When this cribbing had been sunk to a depth of 7 feet below the water level continuous pumping developed a flow of 800 gallons per minute. This flow, obtained in the coldest weather when the temperature averaged zero almost every night, means that when the water is most needed, viz., in the summer months, the average flow will be greatly in excess of 1,000 gallons per minute, since cold weather retards the flow of water from one-third to one-half. This means that from one well 12 feet in diameter and 13 feet deep water enough has been developed for 300 acres of land, pumping only during the irrigating season.

What the further development of this same system means to eastern Colorado can only be imagined. At the present time there are twenty millions of acres of land lying east of Denver, the greater portion of it uncultivated because of lack of water. The soil here is equal to that of any in Colorado. Underlying these lands are large bodies of sheet water. The surface and flood waters in the west have already been appropriated. The underflow waters will next be utilized, and when they are brought to the surface lands now desolate will be the homes of industrious thousands, and will be made to bring forth in abundance food for the country's millions.



There are many places where land can be watered by means of gasoline engines and centrifugal pumps, just as shown in the scene above. In this case the highest point on the land to be watered is 15 feet above the water in the irrigating canal. The water is delivered at the rate of more than 2 cubic feet per second. A Dempster 12 H. P. Four Cycle Gasoline Engine furnishes the power and does the work easily. The land shown was taken as a desert claim, but by pumping the water to the highest point it is now as valuable and productive as any land watered directly from the ditch.

In many localities the water can be pumped from wells, creeks, lakes, etc., and much worthless land reclaimed.

Eighteenth National Irrigation Congress

Pueblo Is Enthusiastic—Governing Board's Early Organization—Publicity Campaign Given Vigorous Impetus—Sketch of New Officials.

What is confidently expected to be the greatest session of the National Irrigation Congress will be held at Pueblo, Colorado, in the very heart of the irrigated West, September 26-30, 1910.

Active preparation for the Eighteenth Congress has begun. The Pueblo Board of Control organized and started active work at an earlier date than any of its predecessors. Since opening its offices in the Central block, Pueblo, early in November thousands of letters to all parts of the country have been written; and tens of thousands of pieces of mail in the form of little documents calling attention to the congress, to Pueblo, to the famous Arkansas valley, and to the State of Colorado, have been scattered broadcast over the country.

The board is well organized, P. J. Dugan being chairman; A. G. Watson, vice-chairman; and R. H. Faxon of Garden City, Kansas, secretary. The board took its secretary from out of town for the reason that Mr. Faxon had been active in the Pueblo campaigns at Albuquerque in 1908 and at Spokane in 1909; because he was a newspaperman; and because he was a resident of the Arkansas valley, whose capital is Pueblo.

The Board of Governors of the congress met at Pueblo in January and reviewed the preliminary work done up to that date by the Board of Control, approved the dates selected, and outlined a great deal of useful work. The paid secretary of the congress, Arthur Hooker, who had been secretary of the Spokane Board of Control, removed to Pueblo with his files and his large fund of experience in January of this year, and is himself actively at work. The Board of Governors plans to hold several meetings at Pueblo prior to the time the Eighteenth Congress will convene.

Pueblo was an admirable selection for the Eighteenth Congress for the reason that it is in a state that has paid attention from the beginning to irrigation and fully appreciates the work of reclamation. Colorado has upwards of 20,000 miles of irrigation canals and laterals; more than three and one-half million acres of irrigated lands; 16 beet sugar mills making sufficient sugar to take care of the average daily consumption of the country for thirteen consecutive days; and thousands of acres of alfalfa, fruit, and truck, all grown under irrigation.

Pueblo is the capital of the wonderful irrigated Arkansas valley, extending from Canon, in Colorado, to Garden City, in Kansas, having more than one-half million acres under irrigation; seven beet sugar mills, one at Garden City, Kansas, costing a million dollars and being the finest in the West; and has one county, Fremont, that last year produced an even million dollars worth of apples, and another, Otero, that produced an even million in the famous Rockyford cantaloupes. In the Pueblo district, there were shipped out, last year, in celery, 125 cars, after local consumption was taken care of. All this is under irrigation, and shows the tremendous importance of reclamation in the territory appurtenant to Pueblo. In addition to this, about one-half million acres is ready to be brought under irrigation, at a cost of approximately 15 millions of dollars.

Pueblo is a great, growing city of 60,000 inhabitants. It has long been known as "The Pittsburg of the West," because of its importance as a leading industrial center. It has the finest steel works west of Pittsburg, and great smelting plants. It has eight railroads, and is on the great Gould transcontinental system, the Missouri Pacific ending there and the Rio Grande beginning. Pueblo has sometimes been called "The Gateway to the Mountain-West," and very aptly. Coal fields in abundance lie at the very door of Pueblo.

But Pueblo has not been content in recent years to be known as an industrial, manufacturing, and railroad center. It early recognized the great agricultural development of the West, and as a result Pueblo will soon be as famous as an agricultural center as for its industrial importance.

Pueblo is geographically situated admirably for holding a great event like the Eighteenth National Irrigation Congress. On the east side of the Great Divide, it is immediately accessible to the Middle West and to the East, which latter region is more and more attending the annual sessions. On the other hand, it is comparatively near at hand to the Pacific West, the great Southwest, and the Northwest country, all of which sections are always represented fully in the National Irrigation Congress.

The international phase of the National Irrigation Congress is receiving much attention at the hands of the Pueblo Board of Control. Dr. E. McQueen Gray of Albuquerque, New Mexico, foreign secretary, early was clothed with proper credentials and full authority from the Board of Control, and has entree to all foreign capitals and the Department of State at Washington. He has already made one trip to Washington and is planning another. He is in direct touch with foreign departments, and thinks he will certainly secure thirty or more foreign representatives for the Pueblo sessions. Among these he hopes to have James Bryce, the British ambassador, and either the head or an important official of the French Department of Public Works.

There will also be held in connection with the congress a great exposition of pumping machinery, building and structural material, and a display of model irrigation ditches and plants. This will be international, and scores of inquiries are coming in to the Board of Control for information. The engineers' society—the Arkansas Valley Society of Arts and Sciences—is taking a leading part in planning this feature of the congress.

There is every indication that the Eighteenth National Irrigation Congress at Pueblo in September next will far eclipse all its predecessors.

PRESIDENT BENJAMIN A. FOWLER.

Benjamin A. Fowler, of Phoenix, Arizona, president of the National Irrigation Congress, was born at Stoneham, Massachusetts, December 14, 1843, and was educated at Phillips Academy, Andover, class of 1862, and Yale, class of 1868.

In 1862-3, Mr. Fowler served in the Fiftieth Massachusetts Volunteers, joined General Bank at New York, was there detailed for special service in the United States signal corps, and was sent to the Department of the Gulf. He was before Port Hudson from the beginning until its surrender, in July, 1863, and participated in most of the battles of that campaign.

Mr. Fowler taught school one year at Danvers, Massachusetts, and studied law one year, following his graduation from Yale in 1868. From 1870 until 1898, he was in business, subscription and publishing, in Boston, New York and Chicago.

Mr. Fowler came West in March, 1899, locating in the Salt River valley near Phoenix, Arizona. In 1901 he was a member of the Arizona Legislature. In 1904 he was the Republican nominee for delegate in Congress.

Mr. Fowler has been president of the Arizona Agricultural Association, president of the Phoenix Board of Trade, president of the Associated Charities of Phoenix,

and president of the Salt River Waterusers' Association. The last named comprises about 1,600 landowners, and includes 210,000 acres of land in the Salt River valley, pledged to reimburse the government for seven million dollars now being expended on the Salt River reclamation project.

For seven years Mr. Fowler was a member of the executive committee of the National Irrigation Association, and at the same time member of the executive com-

SECRETARY HOOKER IS A VETERAN.

Arthur Hooker, secretary of the Eighteenth National Irrigation Congress is, by virtue of that position, a member of the Board of Governors, of which board he holds the position of secretary. He is also secretary of the executive committee of the Eighteenth Congress.

Mr. Hooker was elected secretary of the congress at the meeting in Spokane last August. Previous to that time he was secretary of the Spokane Board of Control.



- (1) Arthur Hooker, Spokane. Secretary Eighteenth National Irrigation Congress.
- (2) Benjamin A. Fowler, Phoenix, Ariz. President Eighteenth National Irrigation Congress.
- (3) R. Insinger, Spokane. Chairman of the Board of Governors and Executive Committee of the Eighteenth Irrigation Congress.
- (4) P. J. Dugan, Pueblo. Chairman of the Board of Control.
- (5) R. H. Faxon, Garden City, Kansas. Secretary of the Board of Control Eighteenth National Irrigation Congress, and its Director of Publicity.
- (6) A. G. Watson, Pueblo. Vice-Chairman, Board of Control, Eighteenth National Irrigation Congress.
- (7) Mineral Palace, Pueblo, Colo. Where the Eighteenth National Irrigation Congress will be held from September 26 to 30, 1910.

mittee of the National Irrigation Congress. In September, 1907, he was elected secretary of the Sixteenth National Irrigation Congress, and reelected secretary of the Seventeenth Congress. At Spokane, in August, 1909, he was elected president of the congress.

Mr. Fowler owns a large ranch nine miles from Phoenix, and has other large landed interests in the Salt River valley. His residence, however, is at Phoenix.

With Mrs. Hooker, he has now taken up his residence in Pueblo, and will devote his experience and training at previous congresses to the success of the Eighteenth Congress.

By education, Mr. Hooker is well fitted for the position of secretary of the National Irrigation Congress. He received the degree of bachelor of science in engineering at the Washburn State College, class of 1907.

In 1907, Mr. Hooker was city engineer of Pullman, Washington, and in 1908 was assistant city engineer of Spokane, resigning from the latter position to take up his work with the National Irrigation Congress.

Mr. Hooker was born in Iowa, November 25, 1880, and has lived the greater portion of his life in the West, having accompanied his parents to Spokane in 1890.

CHAIRMAN INSINGER HAS EXPERIENCE.

R. Insinger, of Spokane, Washington, chairman of the executive committee and of the Board of Governors of the Eighteenth National Irrigation Congress, was born in Holland in December, 1862.

Mr. Insinger lived in the Northwest Territories of the Dominion of Canada from 1885 until 1896. He was engaged in breeding horses and cattle. He was a member of the legislature of the Northwest Territories from 1892 until 1896.

Mr. Insinger removed to Spokane, Washington, in 1897. He is now manager of the Northwest and Pacific Hypotheekbank. He is also a director of the Phoenix Lumber Company, and of the Spokane and Eastern Trust Company, and a trustee of the Spokane Chamber of Commerce.

Mr. Insinger was chairman of the Board of Control of the Seventeenth National Irrigation Congress. At Spokane, in August, 1909, he was elected chairman of the executive committee, and at the same time chairman of the Board of Governors of the Eighteenth National Irrigation Congress.

Mr. Insinger is a man of large affairs, with great capacity for executive position, and is an effective head to the active working organization of the congress.

SKILLED AS AN ORGANIZER.

P. J. Dugan of Pueblo, Colorado, president of the Board of Control of the Eighteenth National Irrigation Congress, is peculiarly fitted for his work.

Mr. Dugan, a successful lawyer, has made a specialty of land, mining and irrigation law, and stands well at the head of his profession in this respect. His skill as such has brought him into public notice and given him a large acquaintance, not only in his own state but in the entire West. With such knowledge he combines rare executive ability, and is a splendid head to the local organization that will bear the brunt of the work of preparation for the next congress.

Mr. Dugan is a native of Oswego, New York, and went to work in New York City as a boy of sixteen years, being then thrown on his own resources. In 1881 he came to Pueblo, and had employment in various county and public offices for several years, being deputy county clerk and chief clerk in the United States land office at Pueblo for a considerable period. Meanwhile, he was studying law, and was admitted to the bar in 1888, since which time he has built up a large and extensive practice.

Mr. Dugan has never entered the public service, though he has had plenty of opportunity to do so, except that he is a member of the city park commission and of the board of education of the city of Pueblo. Both parks and schools, especially the latter, are hobbies of the chairman of the Board of Control, and he has given his best efforts toward putting the school and the parks systems of his home city on a very high basis.

Mr. Dugan is supported in the work of preparation for the Eighteenth Congress by an energetic and capable board that is behind him in his efforts to make the coming congress in September the greatest in the history of the organization.

WATSON AS A PUBLIC BOOSTER.

A. C. Watson, vice-chairman of the Pueblo Board of Control, Eighteenth National Irrigation Congress, was born in Mattoon, Coles County, Illinois, March 8, 1863. In 1864 his parents removed to Leavenworth, Kansas, and in 1869 to Osage County, Kansas.

Mr. Watson came to Colorado in 1889, and for several years was a citizen of the San Luis valley, engaged in the mercantile business. He removed to Pueblo in 1901 and since then has been in the real estate, loan and insurance business.

For the past three years he has been a director of the Pueblo Businessmen's Association, and in 1908 he was secretary of the Colorado State Fair. Mr. Watson has also been a member of the board of directors of the Colorado Commercial Association and of the Colorado State Realty Dealers' Association.

Mr. Watson was a delegate to the Seventeenth and Eighteenth National Irrigation Congresses, and headed the Pueblo delegation to Spokane in 1909 that secured the Eighteenth Congress for his town. He was also elected member of the executive committee for Colorado at the Spokane congress.

In November, 1909, Mr. Watson was elected vice-chairman of the Pueblo Board of Control.

PUBLICITY CAMPAIGN IN STRONG HANDS.

R. H. Faxon of Garden City, Kansas, secretary of the Board of Control, Eighteenth National Irrigation Congress, and its director of publicity, was born near Topeka, Kansas, May 9, 1875. He received an academic education at Washburn College, Topeka, and followed the occupation of stenographer for a time, after which he went into newspaper work and was a political reporter and writer at Topeka for several years.

Mr. Faxon was secretary to Chester I. Long, representative from the Seventh Kansas district and later United States Senator from Kansas for eleven years, retiring as such March 4, 1909.

In April, 1908, Mr. Faxon purchased the controlling interest in the Garden City, Kansas, Evening Telegram, which he has since edited and published.

He was a delegate to the Fifteenth, Sixteenth and Seventeenth National Irrigation Congresses, and at the Sixteenth Congress at Albuquerque in 1908, and the Seventeenth Congress at Spokane in 1909, was a member and secretary of the committee on resolutions. He was appointed a member of the congressional committee by President Barstow in 1908. In November, 1909, he was elected a member of the Board of Control for the Eighteenth Congress, and at the same time a member of the executive committee, and secretary of the board as well as its director of publicity.

Mr. Faxon is a director of the Kansas-Colorado Railroad, of the Kansas State Historical Society and of the Industrial Club of Garden City, Kansas; is a member of the park commission of Garden City; president of the Southwest Kansas Editorial Association; president of the New Santa Fe Trail, the leading good roads organization of the West; and vice-president of the Kansas Day Club.

J. C. WAITE RESIGNS.

Leaves U. S. Reclamation Service to Accept Position with Private Enterprise.

Mr. J. C. Waite, who, since assuming charge of the Settlement Branch of the Reclamation Service at Chicago, has won for himself the esteem and good-will of hundreds of homeseekers, has accepted a tempting offer from private interests, and on February 1st resigned from the Service to accept a responsible position with H. L. Hollister—"the man behind the guns" of the great Sacramento Valley irrigation project—the most monumental of the many Kuhn enterprises.

Mr. Waite is a native of Alabama, and although still a young man, he has behind him a record of nine years of creditable endeavor in the government employ. Since 1904, and until the establishment by the Reclamation Service of its "Settlement Bureau," Mr. Waite was private secretary to Director Newell.

His many friends in the service, and outside of, while regretting the loss of an efficient and congenial co-worker and advisor, cannot help but felicitate Mr. Waite upon his entering a field where his abilities may find unlimited scope.

The Handling of a Train on a Modern Railroad

BY H. R. Newlean

I had by some fortunate change ingratiated myself to such an extent in the esteem of the general superintendent of the Overland Railroad that he extended to me the hospitality of the railroad insofar as such hospitality was not restricted by the provisions of the Anti-Pass Law and the stipulations of other railroad bills.

His private car was attached to the rear of the train upon which I was soon to journey to California, and we were, at the moment he proffered me this courtesy, standing by the monstrous, throbbing, iron steed, which was to pull our train. I had never ridden in the cab of an engine, and as I stood there gazing at this immaculate powerful locomotive, with her seven-foot driving wheels and carefully groomed boiler, glistening in the glare of the electric lights at the Union station; her headlight piercing the darkness a mile ahead, I was impelled by the thought of the novelty and exhilarating experience of a ride alongside the engineer to avail myself of the general superintendent's generous offer



by requesting the privilege of riding in the engine cab to the next district terminal—one hundred and fifty miles west.

I was then introduced to the engineer, and an order followed which consigned me to the front end of the fireman's seat. The engineer was manifestly surprised at this, for it is an unwritten rule not to permit persons to disturb the enginemen by imposing their inquisitive selves in the cab.

As it was about leaving time I clambered up, and as I sat there watching the engineer giving the engine a final oiling here and a finishing polish there, I was impressed with the thought of how little I (who can well represent the general public in its knowledge of railroad operation) knew about the running of a train, although I had many times innocently and with no misgivings ridden in them.

The conductor now came forward and compared time with the engineer; then at the exact schedule departing time, sang out, "All aboard," and gave the "go-ahead" signal. The engineer slowly pulled out the throttle and snorts of seeming protest belched forth from the stack, as if the great monster was angered at the thought of being awakened from her contented purring and "lumber" at the station and mastered by such an insignificant thing as a mere man—for comparatively speaking, insignificant he is, weighing about one-fourteenth hundredth of the locomotive's two hundred and ten thousand pounds. But with each notch the throttle was pulled out she very noticeably leaped forward until it was soon apparent she, too, had entered with me into the enthusiasm of "doing" fifty miles an hour on the smooth racing track of steel before us.

We were now threading our way amongst a maze of red, yellow and green lights of the terminal freight and passenger yard, the meaning of which were foreign to me. I ventured to ask the engineer their significance, but he was too intent on the lookout to answer—standing with one hand on the throttle, the other on the air-brake lever, prepared to bring the train to a quick stop should the locomotive err in picking its way through intricate frogs and switches, the proper course being marked by the colored lights.

We soon rattled over the last switch, and were forging ahead at great speed. After the engineer had settled himself on the seat and seemed less occupied, I thought perhaps he would be open to questions, and I yelled a few at him. He smiled and yelled back, but the roar drowned out the intelligence of his answers, for my ears were not accustomed to the noise. That Nature adjusts our various senses to meet the exigencies of our environments was clearly proven to me, when I witnessed the ease with which the fireman and en-

gineer could understand each other. They later explained to me that they had become so accustomed to this noise that any other sounds, such as speaking, pounding of defective machinery, etc., which do not properly belong to the ordinary roar of a moving train, were as audible to their ears as they would be in the middle of a calm Sahara.

Every mile or so there loomed up before us an automatic electric block signal, displaying green, with two exceptions, when a yellow signal flashed up, causing the engineer to immediately shut off steam and gradually slow up until about half a mile further on we found a red signal, at which he brought the train to a full stop. The fireman told me to lean out of the cab window and look toward the rear to see what happened. One long and three short blasts on the whistle at once caused the flagman to appear at rear of train with danger signals, who immediately started running back. After having gone about a quarter of a mile he stopped (the fireman told me, to put torpedoes on the track to warn a following train should it come upon us). Continuing back until he reached a position about half a mile to the rear, the flagman remained protecting our train from the possibility of a rear-end collision. The red signal had now turned green, whereupon the engineer whistled five times, which started the flagman on the run toward our train. After boarding the rear car he "high-balled" the engineer, and we were off. Arriving at the next station we learned the cause of this signal being red—our train had gotten too dangerously near the rear end of a freight train which had just pulled in on a sidetrack, and the signal had given its warning of this fact.

With the exception of a few other incidents wherein rules for the protection of lives and property were observed with military precision, we reached the next terminal "on the dot."

My curiosity to understand everything I had seen was greater than my longing for California, so that I further availed myself of the official's invitation by asking permission to remain at this terminal clothed with authority to acquaint myself with numerous facts relating to the operation of railroads.

My study was so interesting, and I went into the matter so thoroughly, that I feel somewhat qualified to tell the observations of a layman.

The public has been supplied with abundance of exceedingly interesting, and apparently accurate, divulgments of the financial and physical development of our great domestic arteries of commerce—the railroads—but unless my observations in the literary field have been too limited, very little has been written for the benefit of the public mind concerning the intricacies of railroad management and operation. This is probably due to a belief that the inside working of railroad transportation is something in which the public has no rightful interest. It has been recently demonstrated, however, by the management of at least one of the largest railroad corporations in the United States that this belief belongs entirely to those who feel that there is much to be concealed, and it is not indulged in by the higher officials of properties which employ the most modern, safe and practical methods of running a railroad that are compatible with the earnings which the public may permit. I have in mind a certain system of railroads on which boards of inquiry into the cause of accidents, in addition to the railroad officials, are composed of United States army officers, state governors, mayors of cities along the route, business men, farmers and other prominent citizens whose integrity is undisputed.

The idea that the public might be interested in knowing about the subject treated herein suggested itself on several different occasions while the author was visiting the plants



With Her Headlight Piercing the Darkness a Mile Ahead.

of some well-known manufacturing concerns who make it a practice to invite those interested to enter their factories and to understand the processes employed. Noticing the eagerness with which the thousands of persons, who annually take advantage of such opportunities, listen to the lectures and closely watch the working of machinery, I was impressed with the thought that these same persons would display a like enthusiasm in an elementary treatment of problems which unceasingly confront the railroad president, general manager, general superintendent and subordinates.

We frequently and unhesitatingly entrust our lives and

property to the care of the men who are in immediate charge of the train which we may board, and to the care of the many other railroad employees who are concerned in the safe running of that train, but I venture to assert that there are few who understand how they are brought in safety to the end of their journey.

There are interminable things which affect a train in its unharmed and comfortable rapid passage between stations, but I shall only cover in this article the salient or fundamental principles, which, if not correctly carried out, may result in wrecks. It is a reassuring thought to know that the practice of these principles can be and is successfully surrounded with additional precautions which make them as invulnerable to danger as the most cautious individual in his daily life. The fact that insurance companies double the amount which is paid the beneficiaries of accident policies should the insured meet death in a railroad accident, and that only one hundred and nineteen passengers out of the twenty-eight million persons carried one mile on railroad trains last year, were killed in train accidents, conclusively demonstrates this. At this ratio, if it were a physical possibility, a passenger could ride on a passenger train at a speed of forty miles an hour for six hundred and seventy-one years without stopping before he would meet with death caused by an accident to that train.

First in importance is known as "Rights of Trains," or "has a certain train the right to be running on the main line at a certain time?" How does the train crew get the right to run on the main line at a certain time, and what would likely happen if they did not have such right?

Answering the first part of this question: The "right" is conferred in many ways, but the standard longest lived practice is by what are known as "Working Time Cards" and "Train Orders." If there are only ten trains running in each direction over a certain piece of track—say, one hundred miles long (called a "district," and each one of these ten trains has printed on the "Working Time Cards," a schedule (time due past each station) governing it, and all of these trains are running on time, no "Train Orders" are necessary, because the crew on each train knows, by glancing at the "Working Time Card" and comparing with their accurate watches that a certain train will reach a certain point at a certain time, and that they will have so many minutes in which they can be on the main line before encountering some other train which they must pass or meet. There is a distinction between meeting a train and passing one—a train is "passed" when one on a faster schedule is permitted to go by another train ahead running in the same direction on a slower schedule or badly delayed; a train is "met" when, on a single track, it goes in on a sidetrack or passing track to let by another train running in the opposite direction.



The Train Dispatcher's Office.

Everything runs smoothly without the intervention of "Train Orders" when all trains are on time and only schedule trains run, but should it become necessary to run one or more trains not shown on the time card, these trains, termed "Extras," must run under "Train Orders" and other trains notified of their presence on the road. "Train Orders" are also necessitated when one or more trains become late on their schedules, when each of the trains affected must be kept posted of their whereabouts by "Train Orders."

These "Train Orders" are issued by train dispatchers located every fifty to two hundred miles, depending on how busy the railroad may be. The best place to see how this is

done is to station ourselves in the dispatcher's office. The particular dispatcher whom we are privileged to watch (and it would be a violation of rules for us to disturb him in this manner) is located at "A," and has charge of handling of trains on a stretch of single track railroad west to station "M," at which point is located another dispatcher who performs a similar function on a portion of the railroad west of there. Thus we will see that our particular dispatcher is responsible for the trains only between "A" and "M." Between "A" and "M" are stations about seven miles apart, known as "B," "C," "D," "E," "F," "G," "H," "I," "J," "K" and "L." At each of these stations are one or more long sidetracks and a telegraph operator.

In addition to a telegraph instrument, and an absolutely accurate clock, the dispatcher has before him a large sheet, down the center of which in a perpendicular column are shown the names of the stations from "A" to "M"; on the right hand of this column are blank columns in which will be shown all trains moving eastbound, and on the left hand are similar blank columns for trains moving westbound. If you



Automatic block signals on double track, between Seymour and Sarpy, on the Summit Lane Cut-Off.

are intent on understanding this, would suggest you follow on the diagram incorporated in this article.

The dispatcher has now been notified that train No. 1 is about to leave "A." At the top of the first blank column to the left he makes the entry "No. 1." A few minutes later, outside of the dispatcher's office, we hear train No. 1 leaving, and he enters the departing time (for example, 12:00 M.) in the blank column opposite station "A." Nothing then occurs for probably ten minutes, when the telegraph instrument begins to tick and the dispatcher puts down under "No. 1" opposite station "B," "12:11." From this we correctly infer that train No. 1 has passed station "B" and the operator there has notified the dispatcher of the time.

Another train has arrived upon the scene—this one running east. The dispatcher is told by the telegraph instrument that "No. 2" left station "M" at 12:15 p. m. He enters "No. 2" in the first blank column on the right, showing "12:15" opposite station "M."

So it continues—each train as it arrives on his district is entered on this train sheet, and each train as it passes the stations is reported to the dispatcher and time is entered accordingly.

But all of this time trains are getting nearer and nearer to one another and must soon meet. If they were all regular scheduled trains and on time, the trainmen and enginemen in charge of same would know by referring to their "Working Time Cards" what to do and where to meet, but some of them are "Extras" and some late, so that our dispatcher, who apparently has had nothing to do but enter "O. S.'s," is soon called upon to issue "Train Orders" instructing the trains where they shall meet; he glances frequently and anxiously at the clock, all the while with a look of deep study upon his face, figuring where he shall make the best meeting point so that the least delay may be occasioned to each of the trains affected.

Trains Nos. 1 and 2, which are running late and consequently cannot follow the time card, are now within such a distance of each other that it is necessary to instruct them where they shall meet. The dispatcher knows this by glancing, so that in this instance (for example) station "F" will long hill, a heavy train and probably a poor engine (all of which he must be familiar with) train No. 1 can run only twenty miles an hour at the same time train No. 2, which is light and running on level or down-hill track, is running forty or fifty miles an hour; therefore, in a certain time No. 1 can get to a certain station and No. 2 can travel so far, so that in this instance (for example) station "F" will make the best meeting point. The dispatcher is observed to run his finger down the column under "No. 1" and up the column under "No. 2," until he reaches stations "D" and "H," which have not as yet shown the leaving time of the respective trains, indicating that they have not as yet reached these points. By means of the telegraph instrument he then calls up the operators at "D," "H" and "F" and telegraphs them in

a prescribed form a "Train Order" to the engineer and conductor of each train (Nos. 1 and 2) which conveys to them the information that No. 2 will "go in the hole" (go in on sidetrack) at "F" and let No. 1 meet and go by it.

For the purpose of enabling the operator to inform engineers when they have "Train Orders" to deliver to them, there are provided what are known as "Train Order Boards," which, on most roads, at night display green when there are no orders and red when trains are to stop. The day indication for "no orders" is a board inclined downward from a horizontal position; and at right angles to the post when there are orders.

We understand then that the engineer of train No. 1, when he reaches "D," finds this "Train Order Board" dis-



Near Kearney, Neb., obeying a "stop" signal.

playing red, and he knows there are orders for him, so he stops; the same with No. 2 at "H." The conductors of these two trains then go into the depots and sign for orders, which the operators have for them. Copies of these are handed to the engineer on each train and they proceed.

They are thereby informed as to where they are to meet, and should No. 1 reach "F" first, it will stop and wait on the main line until No. 2 arrives and pulls in on the passing track.

Had one or both of these trains been on time it would not have been necessary for the dispatcher to "put out" this order, nor for the trains to have stopped for same, as the time card would have been sufficient, unless for some reason the dispatcher wanted them to run other than as called for by their printed schedules. This sometimes happens when it is desired to give preference to a "president's special," or other important train.

You wonder why the operator at "F" also gets a copy of this order? That is required on most railroads to afford additional precaution in the event of the remote possibility of the engine and train crews of either train forgetting that they are to meet at that station.

On double track, of course, the problem is less complicated, as trains do not have to meet—only thing the dispatcher has to look out for is to let a fast train get by a slower one.

The foregoing explains the general problem of train dispatching. There are modified forms of substitutes for the "Train Order"; but they all center around this scheme of being directed by a dispatcher located at some point, and by keeping him informed by "O. S.'s" of the whereabouts of the trains, so that if a person understands the above he will have a knowledge sufficient to enable him to know how a train he may be riding on is being run over at least eighty or ninety per cent of the railroad mileage in the United States.

The method described has fundamentally been in use for the past forty years. That there is room for improvement is unquestioned, and that it is not devoid of dangerous possibilities is to be admitted, for it deals entirely with the uncertain "human equation," but innovation is difficult of accomplishment on railroads owing to the necessity in many cases for unity of action of the entire railroad profession. In no other vocation is there such a close harmony of practices; for instance, in the matter of rolling stock, which is maintained

according to the requirements of the safety appliance act and must run over practically every standard gauge railroad in the United States, Canada and Mexico. The officials are banded together into powerful associations, the recommendations of which are common law to the entire profession. Hence it will be seen how a particularly progressive manager will hesitate in inaugurating a practice which is radically different from that in vogue on all of the railroads in the country, for fear he will "lose face" should the new system, through some oversight or unforeseen imperfection, result in a disastrous wreck. A railroad official regards "losing face" in his profession, probably as seriously as would a Chinaman to "lose face" in his country. There are also dire possibilities for him in the investigation, when one considers the tendency of the public mind now to hold the railroad president or general manager criminally responsible for the killing of passengers when it can be shown that they were killed through a practice which he may have inaugurated and which is not substantiated by the practice on ninety-nine per cent of the other railroads in the United States.

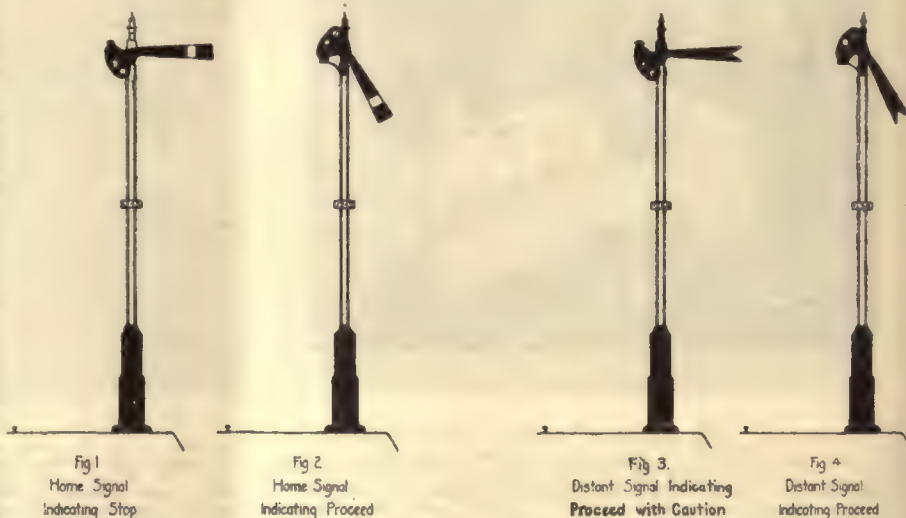
However, I stated that it was possible to surround this method of operating trains with additional precautions which make collisions almost a thing of the past, and the officials are not blind to the imperfections of the system. Thorough indeed is the code of discipline and drill for perfecting the individuals who are entrusted with the handling of trains. However, there was but one perfect man, and no one is immune from an occasional error, momentary oversight, or lapse of memory. In the case of an engineer, a mistake on his part might result in a wreck, but the possibility would be ten thousand times removed, if some one else were warned of his error, so that he could be set right in time, and this is accomplished by automatic block signals. I have an example in mind. Just a few weeks ago a certain railroad had a serious collision in which many persons were killed and a large number injured. This resulted from an engineer incorrectly reading his watch and in such a way that he went by a station at which he should have met an opposing train. Had this line been protected with automatic electric block signals his mistake would have been caught either by himself, the fireman, or surely by the crew on the other train, from the warning which the signals would give of another train encroaching on their rights.

Until recent years disciplining the individual in an attempt to make him absolutely perfect and reliable has been about the only factor in the obtaining of safety (other than improvement in rolling stock and track), but broad-minded managements have surrendered to the inevitable trait of human nature to err, and are today providing means to check errors before it is too late.

The first railroad to be operated was born in England in October, 1825. On account of the very few number of trains which passed over this piece of track, and the slow speed at which they ran they were protected from other trains or objects on the track by a horseman preceding the train waving a flag.

Any one understanding the manipulation of the simple engines used at that time could handle a train safely, but as the number and speed of trains increased such simple methods had to be abolished, and today the position of engineer and conductor requires an extensive experience and a keen vigilance, which is the product only of constant and stern discipline.

For instance, in the movement of the trains which I described from observations in the dispatcher's office, had the engineer of either or both of the trains overlooked to stop at the meeting point, a collision more or less serious would have been remotely impending. These failures are possible, but statistics of a well disciplined railroad show that a train could run around the world on the equator one hundred and



twenty times, passing a station every seven miles before a hazard of this kind would occur.

This perfection of discipline has been secured by periodical examinations on the rules and regulations affecting the movement of trains; by frequent tests conducted by the

officials unknown to the men and by the constant impressions which are made upon the employees' minds in the routine performance of their duties. They all fully appreciate the penalty of a careless error.

The most successful and logical mechanical means of assisting the train and engineers to a proper performance of their duties is the electric automatic block signals, which have been the means of practically eliminating wrecks on railroads where they are employed; that is, wrecks caused by running into other trains, open switches or derailments due to rails in the track ahead being badly broken or missing.

We will suppose the contingency has arisen where the dispatcher has put out an improper meeting order between two trains, or the operator has forgotten to stop one of the trains to deliver the order, or the engineer and conductor of the train have both forgotten it after receiving same, and they "tear" by at full speed the station at which they are to meet the other train. If the road were not equipped with signals and the night a foggy or stormy one, the two trains might pile up around some curve or at the bottom of a slippery hill; but with the automatic signals the engineer's attention will be called to danger ahead at least twice before he reaches the point where such danger exists. Hence a wreck would be averted by these automatic never-sleeping watch dogs which would otherwise have resulted from the susceptibility of the human mind to oversights.

The function of the signals is now understood—the next question is—how do they accomplish this? To make it plain, it will first be necessary to review a few of the basic principles of electricity. The most of us are aware that electrical force consists of a current, which, to manifest itself, must be carried in continuous flow from and to its point of origin by means of wire or other conductors. Various useful and wonderful things can be accomplished when this current passes through instruments constructed for the purpose of utilizing same—lights can be made to burn, motors to run, etc. Motors are the outcome of the magnetic force of electricity. This magnetism is secured by winding a quantity of insulated wire around a piece of soft iron and passing a current of electricity through the wire.

The most widely used form of electric signal consists of a hollow iron pole about twenty-five feet high, at the base of which is located an iron box containing the mechanism which operates an arm from a position at right angles to the pole to one in which the arm is inclined downward at an angle of about sixty degrees, the power being furnished by a motor, the electric current for which is supplied by storage batteries.

On railroads employing what is called the "Normally Clear Position" for the signal arm (see diagram I) the electric current passes through the motor constantly until such time as the signal is required to perform its function of warning for danger, when the current is shut off automatically, as I shall later explain, and the signal arm falls by gravity, impelled by weight of the metal casting shown in the illustration, to a position of "danger" (see diagram I). The current remains shut off as long as conditions on the track, such as a train running over it, a broken rail, etc., require protection, after which the current is again automatically turned on and the motor furnishes the power which is required to pull the signal down to the "clear" position (see diagram I).

This is all controlled through what is known as the "track circuit," the simplest form of which, on single track, is described as follows:

Every mile or so are located track batteries which supply current to the track circuit. In this distance are located two signals—one "home" or "stop" signal and the other a "distant" or "run with caution" signal (see diagram I). Each of these signals has its own power motor, as I have described. One of the conductors for the track circuit is furnished by one of the rails; the return conductor by the other rail. When the track is not occupied by a train or is not otherwise unsafe for passage of trains, the electricity is passing in continuous flow through the two rails in the track to a magnet (or relay), which is thus energized in such a way as to draw toward it by magnetism a piece of metal which forms part of the conductor for a separate current which actuates the motor in the signal box. As long as this piece of metal is held in this position the current can pass continuously into the motor, which in turn holds the signal blade in the "clear" position. Electricity always seeks by the path of least resistance and the shortest route to return to the source from which it emanates. The track circuit arrangement affords a path which has in it less resistance than for the electricity to pass through the magnet or relay above described, and that is, through a train which short-circuits or returns the current to the battery before it has a chance to get to the relay magnet. The magnet is thus de-energized; it no longer has magnetism; the piece of soft iron drops away from it, and the conductor for the current which runs the motor is broken and the signal arm is pulled by gravity to a horizontal position signifying "stop" or "caution," depending on whether a "home" or "caution" signal. The track current passing through the relay magnet is not short-circuited in the case of a broken rail—instead the continuous conductor has been parted by the crack in the rail, and as the current is too weak to cross this crack the current does not continue to pass through the relay magnet, consequently no magnetism is caused and the same action takes place as I have described. In the protection of an open main line switch the circuit is so arranged that when the switch is open the circuit is broken, thus causing the signals to assume a protective position.

Ordinarily, on double track every "home" signal has a "caution" signal synchronized with it so as to work in conjunction with same; that is, whenever there is a "home" signal indicating "stop," a half a mile or so ahead of it there is a "distant" signal indicating "caution," to enable the engineer to shut off on speed and be prepared to stop when

he reaches the "stop" signal. It is for this purpose that the wire line you may see strung along the track is required.

A train on single track has at least one "stop" signal, and sometimes two, in front of it and to the rear, which must be passed by another train before the two can get together. A train on double track has at least one "stop" and one "caution" signal to the rear giving "danger" indications. Therefore, it will be seen that a train traveling over an electric block signaled line is always surrounded with these ever-vigilant sentinels which make it virtually impossible for them to come in contact with other trains, open switches, broken rails, etc.

A summary of the indications given by automatic electric signals is as follows:

- Any arm inclined downward, "proceed."
- A red arm in horizontal position, "stop."
- A yellow arm in horizontal position, "proceed with caution."
- A green light, "proceed."
- A red light, "stop."
- A yellow light, "proceed with caution."

When the protection which is in this manner given the traveler is thought about, an idea suggests itself. In addition to the efforts our law-making bodies are exerting to promote safety on railroads, which, although conscientious, are often badly misdirected and actually have an effect diametrically opposite from that intended, each individual traveler,



Union Pacific Depot and Park, Columbus, Neb.

who values his life or limb, can constitute himself a legislator for safer transportation by patronizing the lines which are protected with automatic signals, gradually forcing the other lines to install them or lose business. It is rather by increasing the earning capacity of a railroad than by curtailing it by improper laws that the most good can be wrought for immunity from accidents, because efficient safeguards cost enormous sums of money. Then, too, it is patent that a railroad which is up to date enough to install electric signaling also affords the acme of comfort in everything else.

ENGINEER HENNY RESIGNS.

Mr. D. C. Henny, consulting engineer of the United States Reclamation Service, at Portland, Oregon, and formerly of California, has tendered his resignation in order to accept a more lucrative practice on general consulting work.

At the director's recommendation he has, however, consented to continue his formal connection with the service on a per diem basis as consulting engineer, to be available occasionally for consultation by the reclamation service on matters with which he is familiar.

Mr. Henny joined the United States Reclamation Service and was placed in charge of Northern Oregon and Washington as supervising engineer. The Umatilla, Tieton and Sunnyside projects were designed and largely constructed under his supervision. The supervisory territory was enlarged in 1906 to include all of Oregon and northern California and in 1907 to include Nevada. Besides canal systems, numerous earth, crib and masonry dams were designed and built under his supervision.

(Continued from page 208.)

up the uniform capillary spaces in the soil and preventing the rise of the water from the subsoil to the surface, and that of covering the ground with a layer of dry soil, or a mulch, that prevents evaporation. Indeed, there are cases where frequent cultivation, or stirring up of the soil, have reduced the accumulations of agali to one-third the amount on uncultivated land. As to its preventing evaporation, every farmer is too well acquainted with the effect of cultivation as a conservative of the moisture in the soil not to know this thoroughly.

The incorporation of organic matter in the soil, such as stable manure, leaves, straw, plowing under a crop of weeds, or green manure, tends to break up the capillary pores in the soil and retard the upward movement of the subsoil water. But this retarding process is much greater if this organic matter is spread over the ground in a uniform layer or mulch. This method alone has saved many an orchard when an adjoining one in the same kind of soil was perishing from an excess of alkali.

It should not be forgotten that it is water that dissolves the alkalis, not moisture. For which reason the water in the subsoil must be kept below the surface at least three, four, five and six feet, according to the soil and the crops. It is the standing water below the surface which soaks up the salts, and they must be drained away until the water table will not send up water, but moisture only, a sort of subsoil evaporation, to coin an expression, the water coming up as wet vapor, or merely wetness, leaving its salts behind, they being unable to follow unless held in solution.

As soon as water from rain or irrigation begins to fill the soil, the standing water below with its alkalis in solution commences to rise, but by keeping this subsoil water at a depth of five or six feet, and thus allowing an easy movement of moisture through the land, the work of reclamation is easily attained. Here is where the rotation of crops may be called upon to aid. The farmer has been growing wheat, barley, small fruits, corn, etc., and the soil has become so impregnated with alkali as to prevent the growth of any more similar crops. Now when he is leaching the alkalis out of the soil he plants gross feeders, plants that have an affinity for alkali. Sorghum and sugar beets are recommended for correctives of alkali soils, but there are many other plants that may be used for the same purpose, such as asparagus, onions, sweet clover, and among fruits, pears, figs, pomegranates and date palms, all of which withstand the action of alkalis which would kill cereals and small fruits.

The reason is that all sugar-producing plants require large quantities of alkali, particularly the carbonates, for starch is produced by the decomposition of carbonic acid, which the plant breathes in through its leaves, and takes up from the soil through its roots. Now, taking the carbon out of the alkalis renders them innocuous, just the same as does vinegar or acetic acid, which is also always forming in plants that produce sugar. Not to be misunderstood, it may be well to say here that this starch is transformed into sugar, woody fiber and cellular tissue. When it comes to raising 20 to 40 tons of sugar beets per acre, carrying 17 to 22 per cent of sugar, and reflect that 100 parts of the green syrup of sugar beets carbonated show 9.18 per cent of alkali ashes, and that the leaves and root fibers will show nearly as much more, it is a simple sum in arithmetic to demonstrate that it will not take many such crops to remove the alkalis, and make it necessary to add more voluntarily as a fertilizer. Indeed, in non-alkali soils it is necessary to add alkalis as fertilizers in cultivating beets. Within two or three years the alkali-devouring plants will have removed so much of the alkali from the soil that barley and wheat can be introduced, and afterward a good stand of alfalfa secured. All of these attempts at reclamation are, in the opinion of the author, equivalent to a rotation of crops, since they benefit and strengthen the soil by taking away elements that certain plants do not require, as well as add those which they need.

The following general rules to follow in reclaiming alkali soil may be considered as a recapitulation of what has been said in this chapter, and in all the authorities on the subject:

First—Insure good and rapid drainage to a depth of three or four feet, in which case flooding the land with water is a simple and sure method of washing out the alkali.

Second—Plow deep; say twelve inches.

Third—Furrow land and plant sorghum in the bottom of the furrows. Irrigate heavily, and gradually cultivate down the ridges to uniformity.

Fourth—After two years in sorghum (or sugar beets, etc.)—deeply plowed each year and cultivated frequently—plant barley. Have the surface of the ground well leveled, and flood heavily before planting.

Fifth—Seed to any desired crop, for if the land is at all porous a stand of any ordinary crop can be secured, except in the worst spots.

What has been said with reference to the black and white alkalis, is applicable to the other alkali salts, the chlorides (common salt, etc.), nitrates, muriates, etc., most of which are beneficial and necessary to plants in reasonable quantities, but deleterious and destructive in excess, but, we repeat, not so dangerous as the sodas.

The processes of chemical transformations are always going on in nature, and every soil, together with the plants or crops growing upon it, constitute a vast laboratory. In which materials of an almost infinite variety are in a constant state of manufacture, and by acquiring even a superficial knowledge of what nature is doing and trying to do, man will be better able to divert nature in his direction to his profit. Nature is perfectly willing that this should be done, and if she is diverted from her purposes and does too much or too little, it is because the man behind the plow is looking the other way.

Adobe soils and the hardpans have been reserved for another chapter, as having a closer relation to drainage, water, and cultivation, than to arid lands. Adobe is a peculiar kind of clay of several varieties, and the hardpans, though sometimes arable, in general resemble the cement plaster which has been found unimpaired in the pyramids and temples of Egypt after thousands of years' exposure to the elements.

It is reasonable to suppose that plants which will grow in heavily charged alkali soils, do so because they have an affinity for the alkaline salts, and take up large quantities of them. Whence it is clear that, by continually growing, cutting and removing this "alkali vegetation," the excess salts in the soil will be gradually eliminated, and thus the soil be fitted for the growth of other desired plants. This is the law and the gospel in the case of the commonly known "salt meadows," of which there are estimated to be in the United States over one hundred thousand square miles. The attempt to reclaim these lands in this manner has proved successful in Germany and Holland, and has passed beyond the mere experimental stage in the United States. Wherefore the query: Is not the same law applicable to the overcharged alkali lands of the arid and semi-arid regions?

FARM LEVEL.

Among the minor equipment of the up-to-date farm are many comparatively inexpensive tools which are fully as necessary as the larger and more extensive implements. In fact, it often happens that to the intelligent use of the smaller tools in economizing in the way of labor and repairing expense, the farmer is enabled to materially increase his annual income. A very desirable and useful tool which is not found on all farms is a level. Such an instrument often comes in very handy and in many cases is a necessity if the work in hand is to be properly done. In ditching some kind of level must be used. Going "by guess" will never assure the proper working of a land drain. Many a farmer who has tried to get along without a good level because of a trifling expense or trouble in procuring such an instrument has learned this to his sorrow.

With a reliable level the matter of proper drain construction becomes a very simple operation. One is assured at the start that the grade desired will be had and there is no chance of future trouble in its working properly. And it has very many practical applications. In fact, its uses are so varied and at the same time so important that even the farmer who has no ditching to do cannot afford to be without one. They are often wanted in extending a water pipe, locating a tank, providing for surface drainage, land grading, laying cement floors, stable gutters, yard paving, and constructing walks and drives. It offers quick and reliable service in laying out lands, dividing and measuring fields, and many other little jobs about the farm.

A good farm level costs little compared with its worth and usefulness. Frequently it will pay for itself in one using, as it admits of economy in both labor and time and may save additional expense in providing the assurance that the work will not have to be done over again.

Reclamation Notes

CALIFORNIA.

By a signed decision of Judge Buckles of Solano county, the injunction asked by Malvina Gallatin, against the Corning Irrigation Company, was refused. The company is now empowered to use the flood waters of Elder Creek.

Farmers of Marysville township propose the organization of an irrigation district, comprising about 4,000 acres. An assessment of \$5.00 per acre will be levied to provide an irrigation system. Water will be taken from the Yuba River at Daguerre point.

Articles of incorporation have been filed by the Ramona Power & Irrigation Company, showing capital stock of \$10,000. The following are incorporators: Ehrman Grigsby, A. W. McPherson, A. H. Koebig, R. M. Miller, H. J. Englebrecht, J. H. Grigsby & T. S. Ingham.

Articles of incorporation for the Land and Irrigation Company of Northern California have been filed with the county clerk at San Francisco. The company is authorized to own and operate irrigation projects and develop water power. The capital is fixed at \$2,000,000. Directors are, Oscar T. Weber, W. P. Read, Burke Corbet and John R. Selby, all of San Francisco.

Jos. H. Bohon, of Los Angeles, has purchased about 8,000 acres of land near the town of Firebaugh, and proposes to irrigate by pumping. It is said that he also has plans for a comprehensive irrigation system to be operated in connection with that owned by Miller & Lux. For the present water will be supplied by pumping.

COLORADO.

Among the recent incorporations is that of the Geary Creek Irrigation & Land Company, with capital stock of \$50,000. The incorporators are: B. B. Markle, Clarence E. Gosselin, Volney C. Gates; all of Greeley.

Fred Lucas, manager of the Denver Reservoir Irrigation Company, has recently made an extensive examination of the construction work on his projects, and reports that the company will be able to supply water to all land in this project during the present season.

Reports from the Canon City, Florence & Pueblo Water Company and the Colorado Southern Irrigation Company, the two corporations having charge of the sale of water-rights for the great De Weese irrigation project indicate that this company is meeting with excellent success in the sale of land.

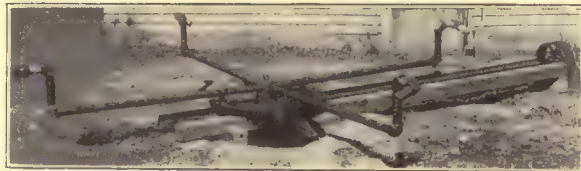
E. C. Van Diest, engineer for the Palmer estate, has filed plats for a reservoir to irrigate a large tract of land east of Colorado Springs. The cost is estimated at \$449,000. Other plats filed by Engineer van Diest show an extensive system of canals and ditches. Water will be drawn from Jimmy's Camp creek. Surveys have been nearly completed.

The Lone Tree Ditch & Reservoir Company, recently organized to irrigate a large tract northeast of Denver and adjoining the Antero district, has been reorganized by the election of James F. Bradley as president. It is claimed that this reorganization will result in rapid progress of construction work, and the completion of the system before January 1, 1911.

The Colorado Southern Irrigation Company has purchased 25,000 acres from the Hill Land & Investment Company of Denver. This land lies along the Arkansas River in Pueblo and Fremont counties. This tract is a part of the 300,000 acres that this company proposes to place under water. It is estimated that the cost of supplying water will approximate \$75.00 per acre.

Promoters of the Costilla Estates Development Company announces that work will begin on the construction of a large reservoir for its project April 1st. Three small reservoirs have already been completed, and approximately 20,000 acres owned by this company have been sold.

(Continued on page 223.)



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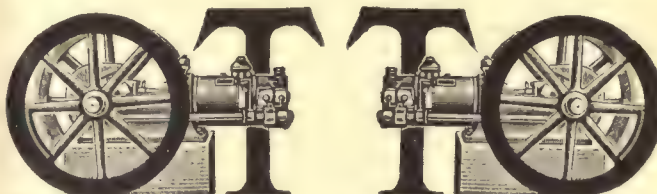
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age caused by leakage, breakage or overflow of canals, or by unavoidable shortage of water supply. The settler agrees to a pro rata distribution of the water available in case of such shortage.

UTAH.—Company reserves power rights in water from final disposal.

Company will transfer, by warranty deed, water rights and interest in the system upon full payment of purchase price, or, at its option, it may issue shares in a corporation to be formed to take over the property.

Provision made for opening of land by drawing.

Shares in operating company—one share to each acre—pass with first payment—to be held by construction company as collateral security for payments due. The company votes settlers' shares until such time as 35 per cent of the purchase price has been paid.

"Units" of segregation are turned over to operating company for control, upon proper certification that such portions of the system are completed according to contract, and "operating company" shall have the right to collect the tolls levied.

When 90 per cent of the total purchase price of all water rights has been paid in full, (or sooner, at its option) the company shall transfer by deed, to the operating company, all of its interests, excepting only the right to sell, or to contract to sell, water rights at that time unsold.

Water is measured where sub-laterals leave main laterals.

Company reserves the right to deliver water by an approved system of rotation.

Company reserves the right to pro-rate available water in case of shortage of supply.

Enlargements of the system may be made with the approval of the board (within a stated period).

Rights of way for roads provided.

Provision made for supplying water to cities and towns.

All notices to purchasers from the land board or from the company to be mailed.

OREGON.—The contract in force in Oregon provides for many things, which, while not made the subject

of specific mention in other States, are nevertheless regulated by statutory, or "unwritten" law, or by departmental regulation. They will be referred to in detail on account of their general importance.

Irrigation season defined; "sufficient water" to be delivered from April 1st to November 1st, and 1.8 acre feet to be assured between May 23d and August 20th. Water to be measured one-half mile from place of use; to be delivered at company's option, by an approved system of rotation, upon ten days' notice, with consideration for the varying needs of different crops. Water to be delivered at the highest practicable point to be reached by gravity flow—such point to be determined by the company. Disputes between company and settler as to point of delivery to be settled by the State engineer. Water shall be delivered under such reasonable rules as may be adopted by the company, and approved by the State Land Board.

Settler shall construct the ditches necessary to bring the water to his land and to distribute it.

In case of shortage of water it shall be pro-rated.

Settlers prohibited from polluting the water in the company's canals, or in the ditches upon their own land, unless such ditches terminate within 200 feet of the boundary of the land.

Company obligated to maintain telegraph or telephone lines along its main canals.

Payments, one-quarter cash or less, at company's option. Balance in three, or seven, annual installments, at Company's option; with interest at 6 per cent.

Company may sell water-rights to "outside lands," with the approval of the State Land Board, upon the same terms and conditions as provided for "Carey Act" lands, and upon the cancellation of an equal area of irrigable "Carey Act" lands. Company agrees to transfer 10 years after date of its contract with the State, to a "corporation of water users," all of its interests. Settler's contract with the company provides for a pro-rata interest in the "corporation," one share for each acre, when such transfer is effected, the "company" retaining possession of shares representing all water rights at that time unsold. No rights of final possession shall pass to any settler prior to such time.

After the organization of such Water Users' corporation, and until the settlers shall have come into possession of a majority of its shares, the company agrees to elect to the board of directors of such corporation, settlers themselves, in such number as their proportionate interest in the ownership of shares shall entitle them to.

Company required to deposit, with the Board, \$1.00 per acre, in cash, with each application for entry, as a deposit for performance of contract, to be refunded at the time of the transfer of the system to the water users' corporation, and contingent upon approval of its work.

Upon default in payment of either principal, or interest continuing for the period of one year, company shall be entitled to take immediate possession of the land and all payments made, may, at its option be forfeited (unless title to land shall have vested in the purchaser and mortgage for same to company shall have been executed).

All necessary gates and devices for taking water at point of delivery to be installed by company at settlers' expense.

Upon 30 days' default in payment of maintenance fee, company may foreclose upon settler and refuse further delivery of water while such default continues.

Water to be used for stock, domestic and irrigation purposes only—water may not run to waste, and all water after leaving ditches upon settlers' land shall belong to the company.

Right of way is reserved to the company over settler's land for all necessary canals and for telegraph or other wires, and for cables for conveying electric current, also for roads, which may be opened by the company, or by the county officials within ten years from date of contract and to be confined to two acres out of every 40 acre tract, in the aggregate—such roads, wherever possible, to go on section and half-section lines—half of such road to be taken from each side of the line,—roads not to exceed 40 feet in width, and to be so located as not to interfere with any permanent buildings, unless compensation be rendered therefor.

Company reserves the right to shut off water for a reasonable period, if necessary, for the purpose of repairing canals and ditches and for such interruption shall not be liable to the purchaser.

To be continued in April issue.

Engineers in charge of the Interstate Canal of the government's North Platte irrigation project, Nebraska-Wyoming, have been busy since the first of January lining the canal bank with brush and gravel to prevent erosion during the coming season. At the Pathfinder dam the equipment and supplies necessary in building the dike are being assembled, a number of teams being constantly employed hauling from Casper to Pathfinder. A board of consulting engineers which met recently determined upon the location and size of the south side tunnel, which will be used as an additional outlet to the reservoir in times of flood, and arrangements were immediately made to begin drilling February 1. The lower portal of the tunnel will be high on the canyon walls.

Send \$2.50 for the Irrigation Age 1 year, and cloth bound copy of the Primer of Irrigation

(Continued from page 221.)

Former Congressman Franklin E. Brooks, D. H. Moffat, and Senator Hughes, of Denver, are interested.

The Elk River Irrigation & Construction Company of Denver has filed articles of incorporation showing capital stock of \$500,000. Maps have been filed with the State Engineer, and it is proposed to divert waters of Elk River at a point near Steamboat Springs, and to carry the supply through a canal to the district north of Maybell. From the main canal a branch will be run along the Mesa on the west bank of the Elk River to water 20,000 acres. The branch canal will extend north of Bear River and Hayden to water 30,000 acres. The directors of the company are Senator Bardwell, Frances E. Garrett, Earl Wilkins, G. J. Bancroft and W. L. Jameson. This land is located in Routt county and aggregates 150,000 acres.

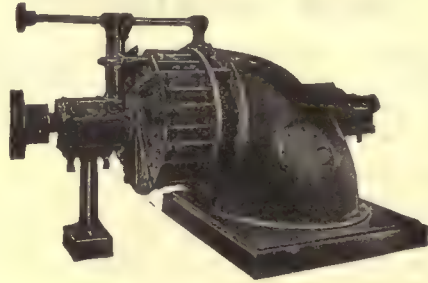
A number of Colorado papers recently published a statement under date line of Montrose, Colo., to the effect that 160,000 acres of land embraced in the Uncompahgre Valley project, in Colorado, would be opened to entry on April 20, 1910. This statement is erroneous as to area and location; the lands to be opened to entry are on the south side of the Grand River, in T. 1 S., R. 2 E., and include about 16,000 acres. They are not embraced in the Uncompahgre Valley project and will not be watered from the canals of this system. No date has yet been fixed for the formal opening to entry of the unoccupied public lands embraced in the Uncompahgre Valley project, Colorado.

IDAHO.

L. G. Bradley, manager of the King's Hill Extension Irrigation Company, at Hammett, states that engineers have drawn plans, and bids will soon be received for the construction of two large dams for this project. The company proposes to deliver water to 8,000 acres for the coming season, and efforts will be made to water all land in this project before early summer.

The Secretary of the Interior has awarded the contract to the Ash Grove Lime & Portland Cement Company of

SAMSON TURBINE



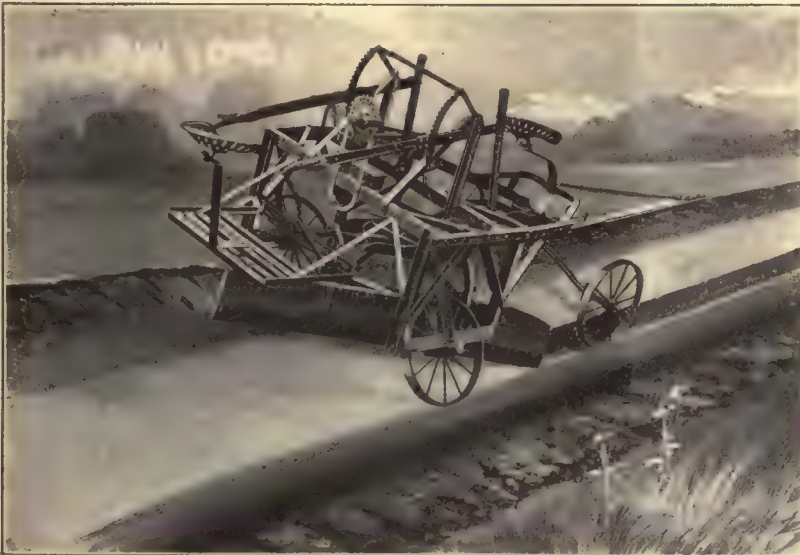
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The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling land-sides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

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The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
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Chanute, Kan., for furnishing 17,000 barrels of cement for use in connection with the government irrigation projects in the Idaho district. Under the terms of the contract the cement is to be furnished at 95 cents per barrel f. o. b. cars at Chanute, Kan.

Engineers have approved plans for the construction of a dam across the Snake River, near American Falls, for the reclamation of 600,000 acres located in what is known as the Bruneau district. By raising the river thirty-four feet water will be backed up from American Falls to Blackfoot on the Snake, and almost to Pocatello on the Portneuf. It is stated that as soon as plans are properly approved, promoters will start active construction work. Idaho capitalists are largely interested.

MONTANA.

The Secretary of the Interior has granted an extension of six months' time to Mr. Henry Dore, of Ridgeland, Mont., in which to complete his contract for the construction of ditches in connection with the Lower Yellowstone project, Montana-North Dakota, until July 1, 1910.

The Beaver Head Ranch Company has recently completed a survey for a dam and system of canals to supply water for the bench lands north of Dillon. The dam will be located on the Big Hole River. By conducting water through a comprehensive system of canals it is said that nearly 100,000 acres will be brought under water.

Preliminary steps have been taken for the organization of an irrigation district in Flathead Valley for the reclamation of 100,000 acres of land between Bad Rock canyon and Flathead lake and from the Kootenai mountains to the western foot-hills. J. L. Donahue, agent for the bond companies now engaged in the Willow Creek and Three Fork projects, involving 23,000 acres near Bozeman, and the Madison River project covering 38,000 acres near Norris, is active in this organization. It is not known what interests are backing Mr. Donahue.

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road, to extend through the Fort Shaw unit of the Sun River project, will commence this spring. In 1909 the engineers of the road located a line up Sun River Valley through the Fort Shaw unit of the Sun River project, leaving the railroad at Vaughn, Mont., and running to a point where the river leaves the mountains. Their engineers located passes and the most feasible route to carry this line through to a connection with the present main line in the vicinity of Columbia Falls. The construction of the line through the valley will give transportation facilities to the Fort Shaw unit and other parts of this project, and whenever the line is carried through the mountains it will undoubtedly place it on a portion of the trans-continental line between Galveston and Seattle. On January 15, 1910, maps were filed in the United States Land office at Great Falls, for the purpose of securing right of way over the government land effected by this location. The president of the Great Northern Railroad Company states that construction will begin as soon as the weather permits.

NEW MEXICO.

W. J. Irwin & Son, of Roswell, have the contract for the construction of a concrete dam across the Rio Felix, for the Acme Irrigation Company of Roswell. Estimated cost \$16,400.

It is reported that the Western Construction Company Wichita, Kan., has the contract for construction of an irrigation plant at Portales, at a cost of \$350,000. The contractors expect to finish this work before June 1st.

During the month of January water was furnished under the Carlsbad project for irrigating winter oats and orchards. Lake McMillan has been filling up constantly but slowly, but the storage in Lake Avalon increased but little owing to the fact that the irrigating water was taken from it. The work of cleaning and repairing under the Leasburg unit of the Rio Grande project was practically completed during January, so that water could be delivered by the first of this month. The appraisers appointed by the court to examine the land required for

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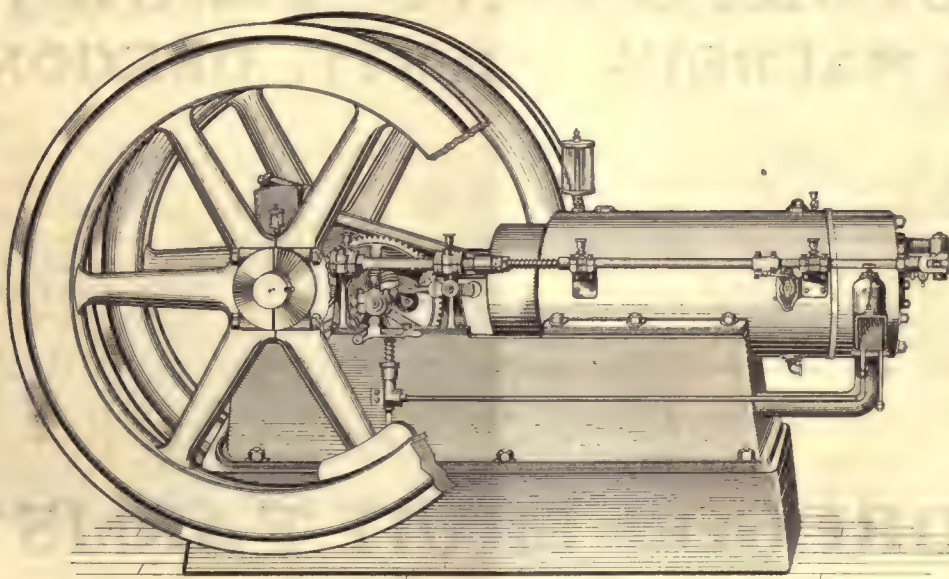
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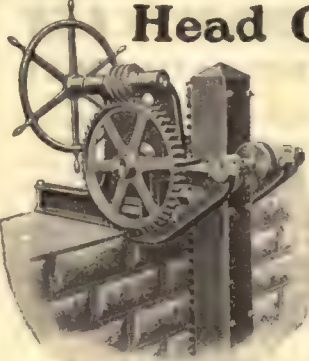
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the Engle reservoir completed their work. It is expected that work can be resumed at once. Surveys have been continued over the El Paso Valley, and that portion known as the Island, containing a number of thousand acres, is now being surveyed.

OREGON.

The Snyder Irrigation Company with principal offices at Dayville, has incorporated with capital stock of \$600,000. Incorporators are, Allen P. Snyder, Ada Snyder and May Snyder.

The Desert Land Board in session at Salem recently authorized the Eastern Oregon Irrigation Company to proceed with its work for the reclamation of 20,000 acres in the vicinity of Eagle creek, in Eastern Oregon.

At the January meeting of the Deschutes Land Company at Salem, J. E. Marlow and A. A. Aya presented a bond for \$30,000, as demanded by the state, and a cash payment to the state of \$1.00 per acre for lands to be reclaimed.

The bondholders committee of the Deschutes Irrigation and Power Company has brought action asking foreclosure of the mortgage, and for a receiver to sell the company's property and remunerate bondholders. Another suit of importance has been filed at Columbus, Ohio, where there are numerous stockholders in this concern.

On February 26th, land owners in the Hood River irrigation district near Hood River, held an election to decide on the issuance of bonds for the completion of the project. The land on the west side of this district has not had an adequate water supply and plans were made for extending ditches to Green Point creek. The cost of these improvements is estimated at \$45,000, but land owners are asked to vote on a \$70,000 issue.

District Attorney John McCourt has brought suit at Portland to annul the rights of the Umatilla Irrigation Company operating near Pendleton. The company was organized in 1892 with Samuel Sturgis at the head. While

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work was progressing rapidly and more than \$20,000 had been expended, Mr. Sturgis died. The district attorney asserts that the company's rights were forfeited by its failure to construct the ditches as mapped out and submitted to federal authorities within a period of five years.

WASHINGTON.

The Pluvius Development Company has started work on a project to water 1,000 acres of land in Spring Canyon, north of Almira. The gravity system will be used.

Promotors of the Klickitat irrigation project in the Horse Heaven country report success in securing contracts from ranchers and land owners. Nearly 500,000 acres are included in this project.


Land owners near White Bluffs are interesting themselves in pumping water for irrigation. Government reports state that artesian wells are feasible. Several heavy land owners are preparing to instal individual systems.

The large irrigation systems near North Yakima, are planning the use of pipe lines to take the place of open ditches. It is claimed that, through the use of pipe, evaporation and seepage will be reduced and that a larger acreage will be placed under water.

Philip W. Blake, special representative of Clinton, Hurtt & Company of Boise, Idaho, states that his company is planning the reclamation of 450,000 acres, of which 250,000 acres are in Washington. He refuses to give a detailed statement of the location of this land, but intimates that the cost will aggregate \$15,000,000.

Reports from the Quincy Valley Water User's Association state that capital has been interested in the project to irrigate 200,000 acres in Grant county near Quincy and Euphreta. The association has filed on 10,000 second feet on the Pend Oreille River near Newport, forty-six miles north of Spokane.

The Spokane and Columbia Land & Development Company, with holdings at River Homes and Crystal Cove on the Spokane River, and at Hell Gate on the Columbia River, is negotiating with the Washington, Water



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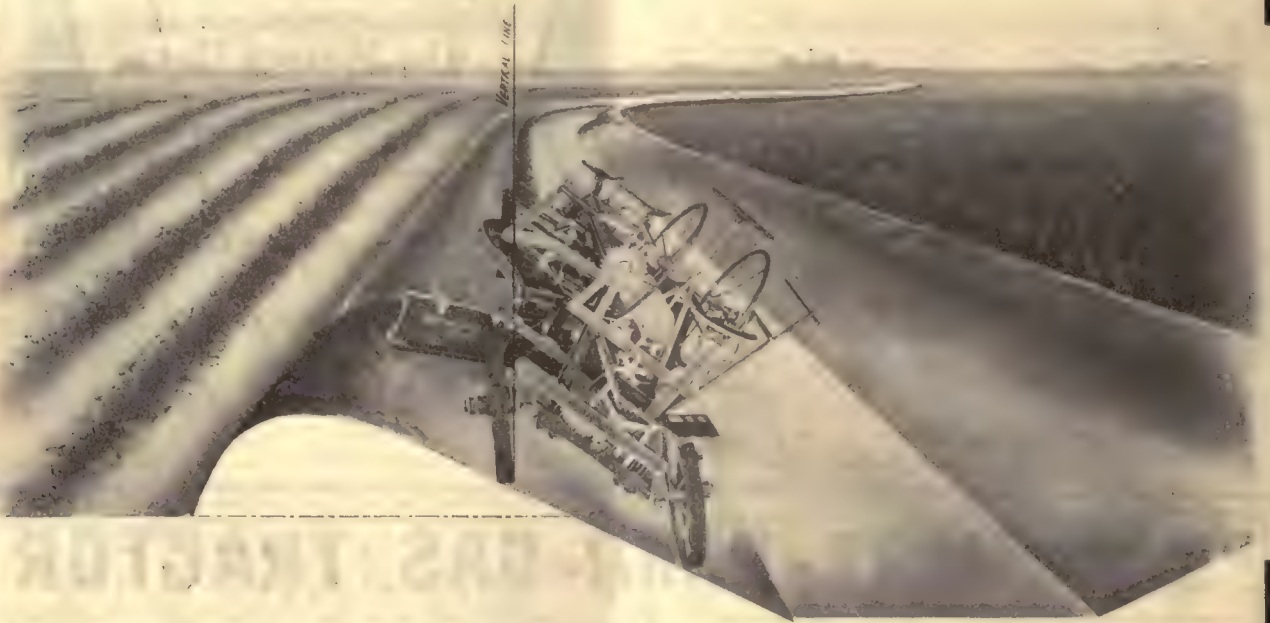
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Write for descriptive folder which gives diagrams of ditches and cost estimates.

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Power Company for electricity to operate pumping plants on these districts.

The government has awarded contracts to E. J. Ward, of Prosser, for the construction of east lateral and sublaterals under the Byron Division of the Sunnyside Unit, Yakima irrigation project, Washington. The contract price is \$4,534.

S. W. O'Brien, of Spokane, plans the construction of an irrigation system east of Bosburg in Ferry county. About 25,000 acres of land are available for irrigation. Surveyors are now in the field and Mr. O'Brien estimates the cost of construction work at about \$1,000,000. By beginning operations at once he expects to place water on this land early in 1911. The supply will be taken from the Kettle River.

The Secretary of the Interior has awarded the following contracts for the construction of flumes, bridges, etc., in connection with the distribution system under the Sunnyside irrigation project, Washington. This work is located near the town of Mabton: W. L. Carpenter, of

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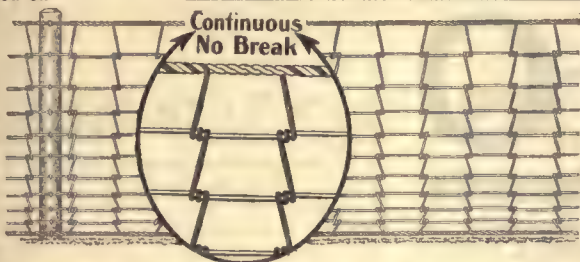
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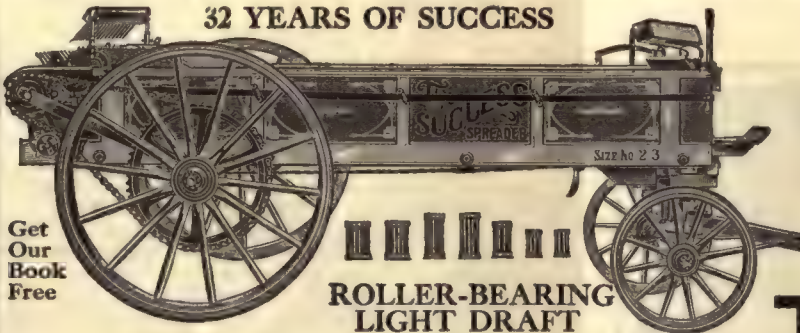
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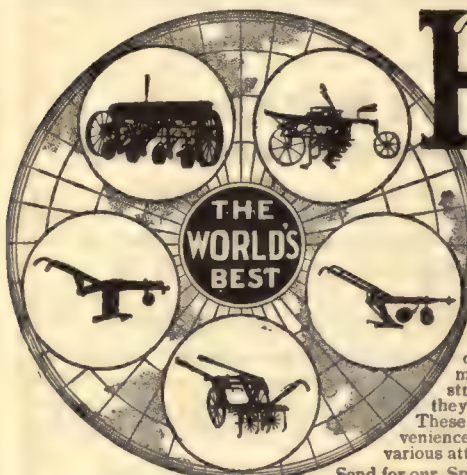
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The Secretary of the Interior has approved the report of the Board of Engineers submitting plans for securing additional storage capacity to provide 40,000 acre-feet of water for the lands under an extension of the Sunnyside canal. This storage is to be obtained at Lake Kachess, where, in addition to the present available storage, the requisite amount can be obtained by deepening the drainage channel from the natural lake and providing regulating works for the same which will be a part of the permanent construction on the ultimate plan for the Kachess Lake storage reservoir. This work, which will be partly earth excavation, it is estimated will cost between \$50,000 and \$60,000.

UTAH

Articles of incorporation have been filed by the Richlands Irrigation Company of Salt Lake City. Capital stock is fixed at \$300,000, divided into shares of \$1.00 each. The company takes over the water-rights and reservoir site owned by P. T. Black in Millard county, also 10,840 acres of land belonging to D. B. McIntosh in the same county. Water-rights consist of 24 second feet in the Sieber river. Elmer B. Jones is president; Geo. T. Odell, vice-president, and D. B. McIntosh, secretary and treasurer. The officers, with L. H. Farnsworth and S. B. Stephens, compose the directorate.

By arrangement with the Gunnison Irrigation Company the city of Gunnison has assumed control of the irrigation ditch at that place.

The Coveville Irrigation Company of Coveville, Cache county, has filed articles of incorporation with the Secretary of State. H. H. Allen is president, Fred Totenson, vice-president, and D. K. Allen, secretary.

Under the direction of the Green River Commercial Club at Green River, an irrigation district for that section is now being formed. It is believed that by this organization nearly double the present acreage can be placed under water.



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MISCELLANEOUS.

Rice farmers near Orange, Texas, are interesting themselves in irrigation, by pumping. Several land owners have already placed contracts for pumping machinery.

The Alfalfa Ditch & Power Company of Thedford, Neb., has applied to the State Board of Irrigation for privileges on the Loup River, near that city. The company proposes to construct a ditch twenty-two miles in length to supply water for about 10,000 acres.

Capitalists of Reno, and other Nevada cities, have applied for the right to reclaim 200,000 acres in the Amargosa Valley. This land lies in the new county of Clark and extends south from Gold Center to Parhump. It is claimed that the company is ready to spend \$4,000,000 in reclamation work. Water available is sufficient to irrigate 10,000 acres, but it is supposed that subterranean streams can be tapped for a much larger supply.

Fire destroyed the plant of the Riverside Irrigation Company near Jennings, Louisiana. Loss of business and machinery is estimated at \$25,000. Contracts for new pumping machinery will soon be placed.

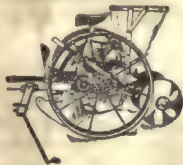
W. T. Eldridge, president of the Sugarland Railroad, and a prominent cane grower, has acquired large land holdings near Sugarland, Texas. He proposes to construct an irrigation and drainage system. The company having charge of the development of this project is known as the Sugarland Improvement Company.

The Rochester, N. Y., Chamber of Commerce recently received the report of K. N. Robins, delegate to the National Irrigation Congress at Spokane. It is said that farmers in the

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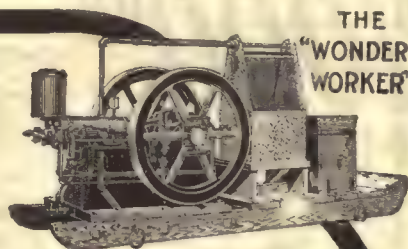
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Nature has given you the water. It may be ponds or running streams. Pump it into your own reservoir. Let heavy rain-falls fill your reservoir and have a supply for the hard dry spell. A reservoir will cost but little to build. Get an I H C gasoline engine—it'll cost very little to own, and then you have your irrigating system forever—for this powerful little engine doesn't know what it is to wear out, is always ready for work, and will pump unlimited quantities of water for you at amazingly little cost.

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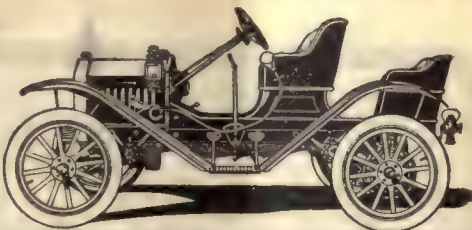


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The Fruit-Grower is the world's leading fruit and farm magazine—brimming over with hints and helps for fruit growers. January—Special Spraying Number; February—Annual Gardening Number; either issue worth a dollar to anyone interested in fruit—sample free. The "100,000 Club" is a Great National Organization to benefit fruit growers in a practical way. Everyone will want to join. Send coupon today for "the way to earn a prize" and get busy.

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Tell me How to Earn the Auto or One of the Big Cash Prizes.

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WHICH PRIZE WILL YOU GET

vicinity of Rochester are taking great interest in irrigation affairs and that there is prospect of early installation of pumping plants.

One hundred and eighty-five thousand acre-feet of water are now stored behind the Roosevelt dam, Salt River irrigation project, Ariz., and the amount is increasing steadily, as the Verde River has been supplying more water than was needed for irrigation. During January the contractors placed 6,500 cubic yards of masonry in the dam, which is now 82 per cent complete. One hundred and fifty feet of the south end of the dam is at an elevation of 228 feet, 200 feet is at an elevation of 203 feet, and the lowest point of the dam is 165 feet in elevation. The installation of the fifty-eight inch valves at the intake of tunnel No. 2 is complete.

Work has been temporarily suspended on the Belle Fourche dam, South Dakota, owing to the cold weather. A large force of men is employed by the contractors on the Belle Fourche Valley Railroad, building bridges across Red Water and Belle Fourche Rivers, Owl Creek and the Indian Creek laterals. This work is so well advanced that there will be no delay in laying the rails through the government townsite as soon as grading is completed early in the summer. A large quantity of material and supplies has been assembled at Belle Fourche and preparations are being made to build a roundhouse there.

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when are you going to Drain or Irrigate that farm of yours? You don't need a surveyor. Get a **BOSTROM IMPROVED FARM LEVEL** and do the work yourself. Simplicity, Accuracy, Durability, Guaranteed. This Level is no makeshift. It has a Telescope with Magnifying Lenses, enabling you to read the Target a quarter of a mile away; and is used and endorsed in every State in the Union. **SATISFACTION GUARANTEED OR YOUR MONEY BACK.** Shipped on receipt of price, \$15.00, or, if preferred, will ship C. O. D. subject to examination. Outfit includes Level, Tripod, Graduated Rod and Target, full instructions and a copy of Bostrom's Book "Soil Salvation" of twenty-five years experience in draining and irrigating. Send your order **TODAY** to—

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SAVING THE PEACH CROP.

For years the peach brown rot has been recognized as a most disastrous disease of stone fruits. This is a fungous disease, and it is widespread, and very destructive to the peach crop. The loss which it inflicts on peach growers will easily average \$5,000,000 yearly. The loss to the peach crop of Georgia alone is estimated at \$1,000,000 a year.

Much work has been done with a view to discovering a satisfactory remedy for this trouble. Spraying with diluted Bordeaux mixture has been most commonly recommended, but its injury to the foliage has made it unsatisfactory, since the remedy must be applied during the growing season.

The peach scab (often called "black spot") is another disease which seriously affects the peach crop in all sections east of the Rocky Mountains, although not causing such serious losses as brown rot.

As the result of experimental work by the U. S. Department of Agriculture, a cheap and simple remedy for this disease has been found in the self-boiled lime-sulphur wash. This can be applied during the growing season with very little danger of injuring the fruit or foliage, and it is very effective. Furthermore, by mixing arsenate of lead with the fungicide, the curculio can be destroyed at the same time.

The department has just issued a bulletin describing the preparation and use of the remedy. This publication will be of great interest to peach growers in all sections.

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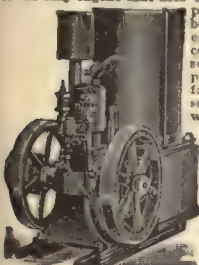
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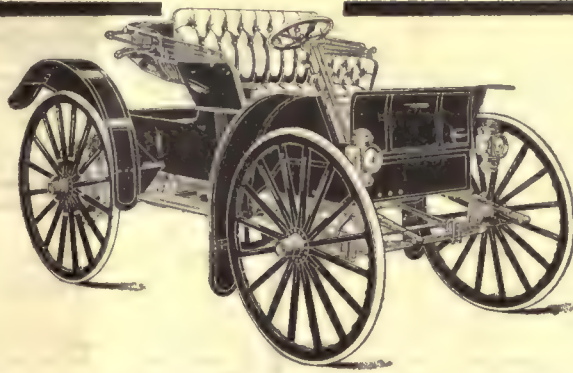
Gasoline Prices Rising.

You can't run a farm engine profitably on gasoline much longer. Price of gasoline going sky high. Oil Companies have sounded the warning. Kerosene is the future fuel and is now 6c to 10c a gallon cheaper than gasoline. The Amazing "Detroit" is the only engine that uses common lamp kerosene (coal oil) perfectly. Runs on gasoline, too, better than any other. Basic patent. Only 3 moving parts. Comes complete ready to run. We will send a "Detroit" on free trial to prove all claims. Runs all kinds of farm machinery, pumps, saws, separators, churns, feed grinders, washing machines, silo fillers and electric lights. Money back and freight paid both ways if it does not meet every claim that we have made for it. Don't buy till you get our free catalog. 2 to 24 h. p. in stock. Prices \$29.50 up. Special demonstrator agency price on first outfit sold in each community. 2000 satisfied users. We have a stack of testimonials. Write quick. (30)



The Amazing "DETROIT"

Detroit Engine Works, 311 Bellevue Ave., Detroit, Mich.



Easier to Operate than Any Other Car

YOU will not only find the I H C auto buggy the easiest to drive, but it is so simple and easy to operate that your wife and children can use it with perfect safety. If you need to go to town or visit a neighbor it is always ready. No time is lost in hitching up.

The I H C Auto Buggy

will travel any road—over hills, through mud, snow, etc., at 1 to 20 miles an hour. The large wheels protect you from jars when going over rocks, clods and bumps. The solid rubber tires make punctures "blow-outs" and the resulting delays impossible. They do not flatten out and loosen the dirt and gravel like the inflated tires do. It's the "suction" tire cars that are doing nine-tenths of the damage to the roads. You can use an I H C buggy when you would not dare to take a horse out. It is never affected by the weather and it never gets tired.

For Business or Pleasure

It is the most sensible, serviceable vehicle. If your wife and children want to go to town or on a pleasure trip it doesn't mean taking a team from the work in the field if you own an I H C auto buggy. The International auto wagon has the same engine construction as the auto buggy. It will meet your requirements for a light delivery wagon. The full elliptic springs (36 inches long by 1 3/8 inches wide) and the long wheel base make it easy running and give it a stylish appearance. See your local dealer or write the International Harvester Company of America at nearest branch house for further information.

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LEASES WATER POWER.

The secretary of the interior executed a contract on behalf of the government with Wonder Electric and Power Company, of Philadelphia, whereby the latter company leases for a term of ten years, beginning May 11, 1911, the right to develop and utilize the water power located on the main canal of the Truckee-Carson project, Nevada, at or near a point where the waters delivered by the canal are discharged into Carson river. The maximum rate of discharge at the point for the purpose of this lease is not to exceed 500 acre-feet per day except under exceptional circumstances. The contract provides that the government is to receive 10½ cents per acre-foot for water delivered and utilized.

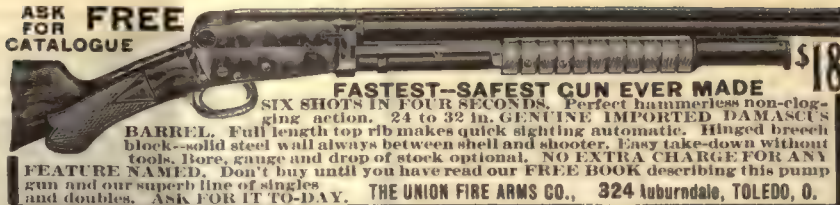
QUINCY VALLEY PROJECT

Engineer Joseph Jacobs, recently consulting engineer of the Reclamation Service, is to make his report on the Quincy Valley project in Washington.

Mr. Jacobs signed a contract with the Quincy Valley Water Users' Association last October to make the preliminary survey for watering from 300,000 to 500,000 acres in Grant County, Washington. Two sources were considered feasible, the larger being from the Peud d'Oreille river in Idaho, the other being Wenatchee lake. Mr. Jacob's report will settle the question.

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SIX SHOTS IN FOUR SECONDS. Perfect hammerless non-clogging action. 24 to 32 in. GENUINE IMPORTED DAMASCUS BARREL. Full length top rib makes quick sighting automatic. Hinged breech block—solid steel wall always between shell and shooter. Easy take-down without tools. Bore, gauge and drop of stock optional. NO EXTRA CHARGE FOR ANY FEATURE NAMED. Don't buy until you have read our FREE BOOK describing this pump gun and our superb line of singles and doubles. ASK FOR IT TO-DAY. THE UNION FIRE ARMS CO., 324 Hubbardale, TOLEDO, O.

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The Geary Creek Irrigation & Land Company; \$30,000; W. J. McDonald, J. L. Brown, M. M. McDonald; Denver.

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Ramona Power & Irrigation Company; \$10,000; Ehrman Grigsby, A. W. McPherson, A. H. Koebig, R. M. Miller, H. J. Englebrecht, J. H. Grigsby, T. S. Ingham; Los Angeles.

UTAH.—The Richlands Irrigation Company; \$300,000; Elmer B. Jones, Geo. T. Odell, D. B. McIntosh; Salt Lake City.

Coveville Irrigation Company; \$500; H. H. Allen, Fred Totenson, D. K. Allen; Coveville.

OREGON.—The Snyder Irrigation Company; \$50,000; A. P. Snyder, Ada Snyder and May Snyder; Dayville.

Send \$2.50 for
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one year and
The Primer of Irrigation

Cheap twine is not good economy

WE want every farmer in this country who uses our twines to go through the entire harvest season without one break in the field. We have set out to make that the standard test of all twines, and we believe that I H C twine comes nearer being such a grade than any other twine.

We have taken this matter the more seriously because we have stood back of the Sisal and Standard Sisal twines and the better grades of Manila ever since twine was made.

85 to 90 per cent of all the twine used is Sisal. It comes in a larger strand than the Manila twine; and, as all binders are adjusted to use this twine, the result has been that the bigger, stronger twine has proved more satisfactory in actual mechanical binding. Its only equal is the higher grade, higher priced Manila, which also bears the I H C trade-mark.

These two twines represent the highest point of excellence thus far attained in binder twine. You get the best when you ask your dealer for an

I H C Brand of Sisal—Standard Sisal—Manila or Pure Manila

You get a twine that has made its record in millions of wheat fields.

One that is guaranteed of standard length and standard strength.

One that is smooth-running; that works at a steady tension, without kinking or tangling in the twine box, and consequently without any loss.

One that has the smallest percentage of breaks and that works well in the binder knoter. Good binder twine is as important to you during harvest as good weather. You cannot regulate the weather, but you can pick your twine. If you want to be positive that you will have no twine delays, choose your twine—Sisal 500-ft.; Standard (which is made from pure Sisal) 500-ft.; Manila 600-ft., or Pure Manila 650-ft.—from any of the following I H C brands:

**Champion Deering McCormick
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These brands mean time-insurance for you during harvest.

Let your local dealer know well in advance what your needs will be. The mills are working now. And if you want more interesting facts on binder twine, write nearest branch house for particulars.

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From 600 trees Miss Cowperthwaite harvested 450 boxes summer and fall apples; 3,000 boxes of winter varieties, which sold for \$1.35 per box, making a grand total of \$4,657.50. Photo taken October 9, 1909, Santa Fe District.

Land Opportunity in the Santa Fe District

Get your share of the profits on the present day high-cost of living.

Prices on food stuff are governed by the law of supply and demand.

Secure a 20-acre tract in the Santa Fe District and be a producer, and at the same time reduce your own expenses.

This land all within a short drive of New Mexico's beautifully situated capital city.

Proven by government statistics to be the finest climate in the world.

Two town sites on the land and two railroads crossing it. Every tract within three miles of a town site.

A former governor of New Mexico says: "THE SANTA FE DISTRICT HAS MORE ADVANTAGES AND FEWER DRAWBACKS THAN ANY IRRIGATED SECTION IN AMERICA."

Send for call for full particulars.

National Mortgage and Bond Company

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Pick-ups by a Staff Representative

As an evidence of the boosting tendencies of the irrigation towns, the following is reported from Lamar, Colorado:

The Denver & Gulf railroad, a new line from Denver to Dallas, Texas, approached the Commercial Club of Lamar on the subject of going through that town, and making it a division point. As a result, Lamar raised \$100,000 in cash in two weeks' time, and the money is now on deposit in the bank as a bonus. In return therefore, the town will be a division point. The city also agreed to furnish the right-of-way and a building site, on condition that the shops should be built and operated on that

for twenty-five years. Lamar also has the privilege of locating town sites, not to exceed four, for a distance of fifty-five miles.

In the old days, when western Kansas was poor, long before the automobile became a common joy, eastern trust companies held mortgages on nearly every farm. It is related that a company, forced to unwillingly accrue a large amount of this land, sent an expert out to look it over. Driving all day under the blistering sun, over a desolate waste, he came to one tract, on which still existed a broken down ramshackle hut. There was a hole in the place of a window.

"Well," said the agent, "I pity the poor native who has to live in a hole like that." Just then a head stuck itself out of the window and shouted, "I ain't so poor as you think I am, stranger. I don't own this land."

The Lock and Key To Your Water Supply



NORTHWESTERN
WORM-GEARED STAND

WATER is the life of the irrigation system and the irrigated farm. If the headgate breaks or washes out, the water is lost and your crops are ruined. Water lost means money lost. The headgates in your reservoirs and irrigation canals are the locks and the headgate lifts are the keys to your water supply. The security of your water supply depends upon the strength of your headgates.

NORTHWESTERN IRON HEADGATES

Never Leak. Last a Lifetime

They are easy to operate, save more than their cost in time and trouble; can always be depended upon to hold your water supply until you need it. They are used on large irrigation projects all over the country.

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any pressure—any size—any price.
Every irrigator and irrigation engineer
should have one. Write today.

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NORTHWESTERN
BALL-BEARING BASE LIFTS



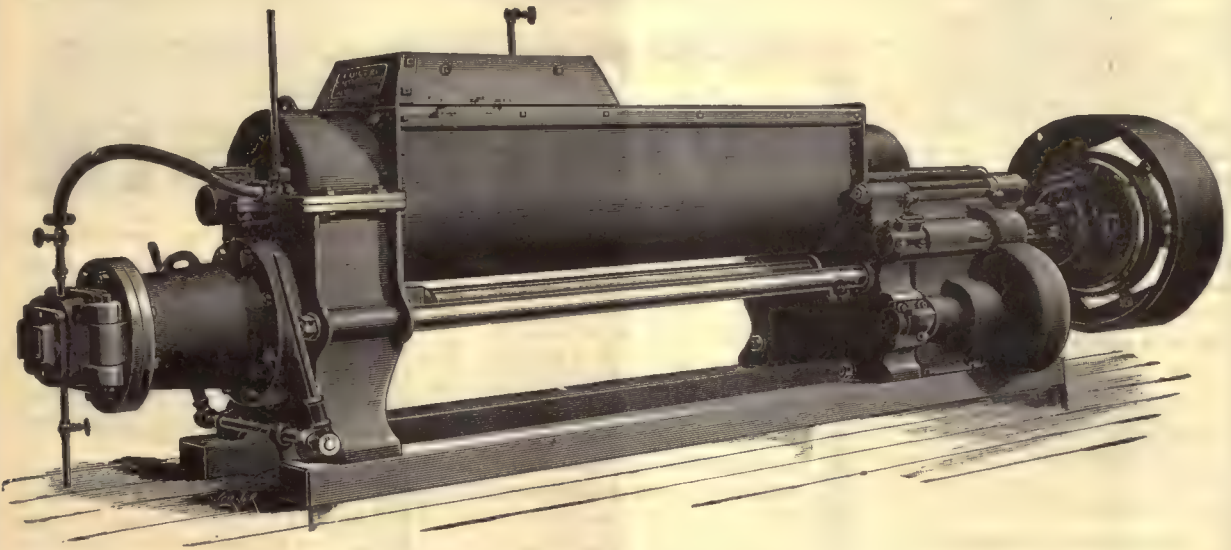
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If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

Two Opposites and a Happy Medium in Automobile Buying

FIRST—Automobile buyers who demand the highest quality car and have means to purchase whatever they want, used to buy foreign cars.

Later, they found that high-priced American cars equalled foreign cars, and so they bought expensive American cars.

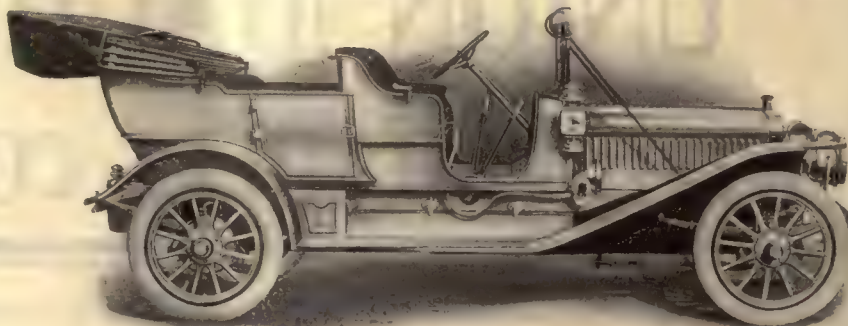
Later still, having learned more and more about actual values, the wisest of these buyers determined that high-priced makers were standing still—that is, either were not improving their cars in ratio to general automobile progress, or else were maintaining their high prices even when the cost of production had been greatly reduced.

So these buyers sought relief.

SECOND—Buyers of limited means and those who believe in "playing a safe game" used to start motoring in the lowest priced car they could buy.

Unfortunately, these cheap cars had a way of proving expensive to keep running, and in order to escape continued expense, these buyers soon graduated to somewhat better cars.

Still, however, there was a tendency to *keep down* the purchase cost. And even these somewhat better cars fell short of perfection. Perhaps they were noisy, or lacked something in power, seating capacity or style. They couldn't quite keep up with the procession. And so, the next step was to find a car presenting two elements: 1—All the quality a motor car ought to have. 2—A purchase price representing a dollar's value for every dollar of price.



This is the self-cranking, 48 horse-power Winton Six Touring Car—\$3000.

WINTON SIX

Thus we note two opposite tendencies on the part of present-day automobile buyers—tendencies brought about by expensive experience.

Both classes of buyers are coming to the same car—a happy medium.

These facts account for remarkable sale of 1910 Winton Six cars.

Because: 1—The Winton Six contains all the *quality* a motor car ought to have; and 2—the price represents a dollar's car-value for every dollar of price.

The Winton Six has six cylinders, because less than six cylinders mean less than excellence.

It has an ample motor of 48 H. P., an oil-bathed multiple disc clutch of large diameter running on ball bearings, a four-speed selective transmission running on ball bearings, a carburetor that is instantaneously sensitive, Bosch magneto, with special battery for starting (at no extra charge), 124-inch wheel base, frame narrowed in front to permit short

turns, easy-riding, semi-elliptical springs all around, four shock absorbers, a snappy-looking, roomy, five-passenger body, and a self-starter that *cranks the motor* without physical labor. The only self-starting motor in existence. Air pressure does it; open a valve and the motor starts.

And the price of \$3000 represents all the actual value it is possible to put into a car—a price that dismays competition.

This car hasn't a superior. Equal horse-power in other reputable makes will cost you \$4000 and more. Thus the price of the Winton Six saves you the cost of gasoline, oil and tires for two years' running, and when you get a Winton Six you get a self-starting, sweet-running, flexible, hill-climbing, pride-producing car, and the one that holds the world's upkeep record of 184,190 miles on \$142.43 upkeep expense—77 cents per 1000 miles.

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THE WINTON MOTOR CARRIAGE CO.

86 Berea Road, Cleveland, Ohio.

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We can quote some especially low prices on high-grade used cars.
If interested, ask for figures.

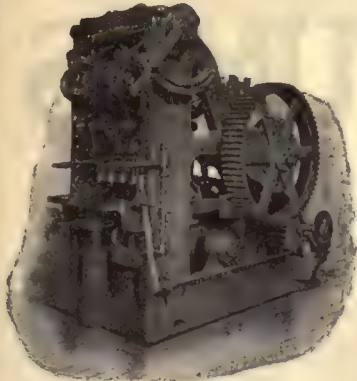
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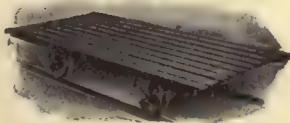
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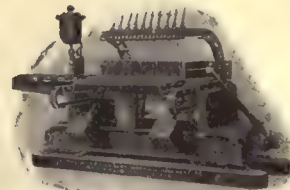
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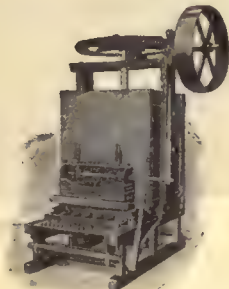
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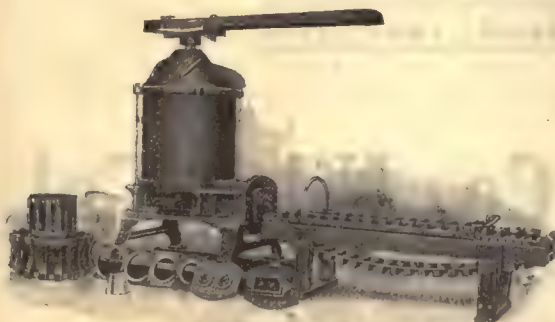
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PUMPS FOR EVERY SERVICE,
BUT MAKE A SPECIALTY OF
IRRIGATING PUMPS

**WHERE THE SOURCE OF SUPPLY IS EITHER
DEEP OR SHALLOW, BORED OR DUG WELLS**



Plant of A. T. AMES MFG. CO.
From a Photograph

**By our system water can be pumped at a
fuel cost of from 2c to 3c per thousand
gallons per hundred feet lift**

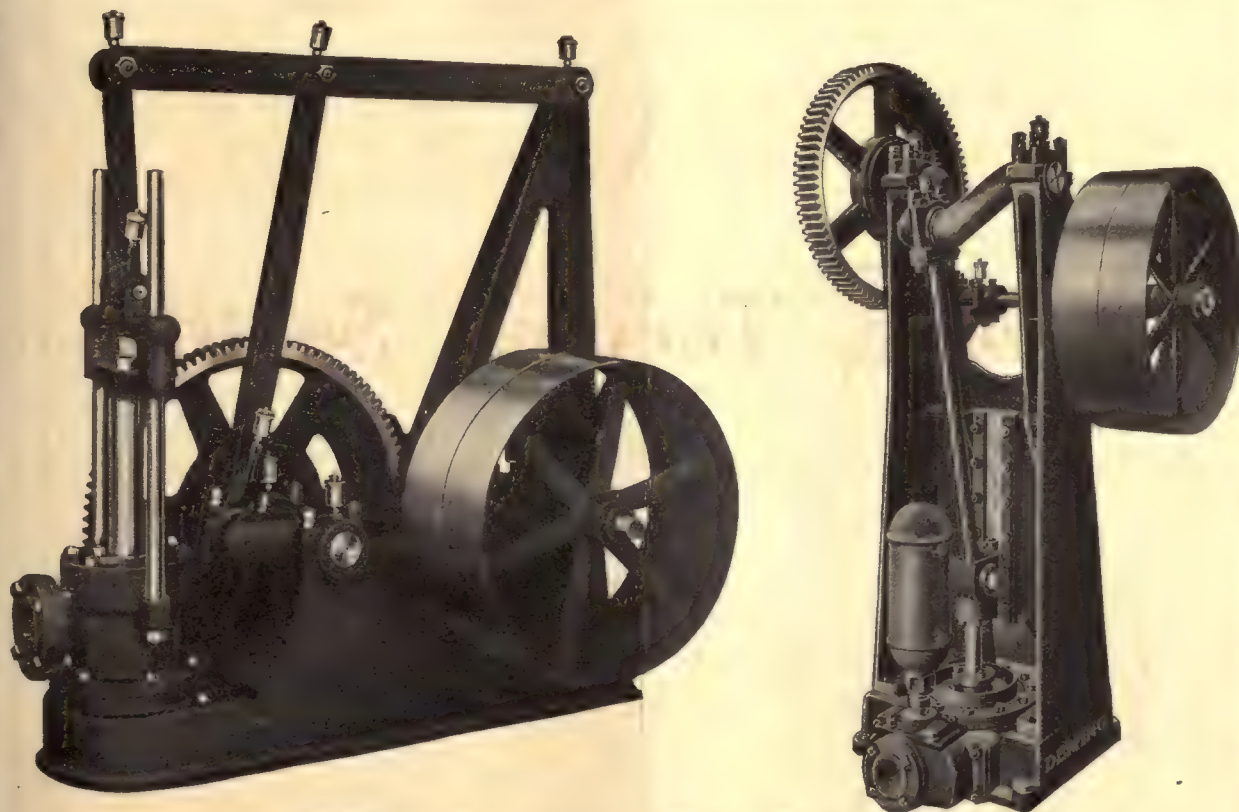
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A. T. Ames Mfg. Co., Niles, Cal.

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Deep Well Working Heads



These Working Heads Can be Operated by Electric Motor, Gas or Gasoline Engine, Steam Engine or Belt Driven—the Motors and Engines being Direct Connected if Desired.

The chief advantage to the possessor of a Deming Deep Well Working Head is in the immense saving of power money in direct proportion to the great depths from which the water can be pumped.

Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

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Tickets good on Tourist Sleeping Car on payment of berth rate

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THE IRRIGATION AGE

VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO 6

CHICAGO, APRIL, 1910

To Reduce Seepage in Irrigation Ditches



two precautions must be taken. The first is not to disturb the original soil beyond the ditch sides and bottom. The second is to line the ditch with impervious material.

An AUSTIN DRAINAGE EXCAVATOR carves a ditch from the original soil to exact shape and dimensions—clean and smooth—so that it can be lined without trimming or shaping and without templates.

Because of these things, and because it takes out material at a lower unit cost than can any other machine, the Austin Drainage Excavator is the most perfect irrigating ditch machine known. It digs in one operation, to exact template, a ditch with sloping sides, wide berms, even spoil banks, and true to grade, at a unit cost cheaper than a similar ditch can be dug by any other means.

OUR FULL LINE COMPRISES:

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The Austin Side Hill Ditcher
The Austin Tile Ditcher

The Austin Highway Ditcher
The Austin Drainage Excavator
The Austin Orange Peel Ditcher

The Austin Drag Line Excavator
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The Temple Water Elevators -- The Temple Centrifugal Pumps

Manufacturers of all kinds of Hand and Windmill Pumps

Also Manufacturers Single Cylinder, Double Cylinder and Four Cylinder Gasoline or Kerosene Engines

Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

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Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

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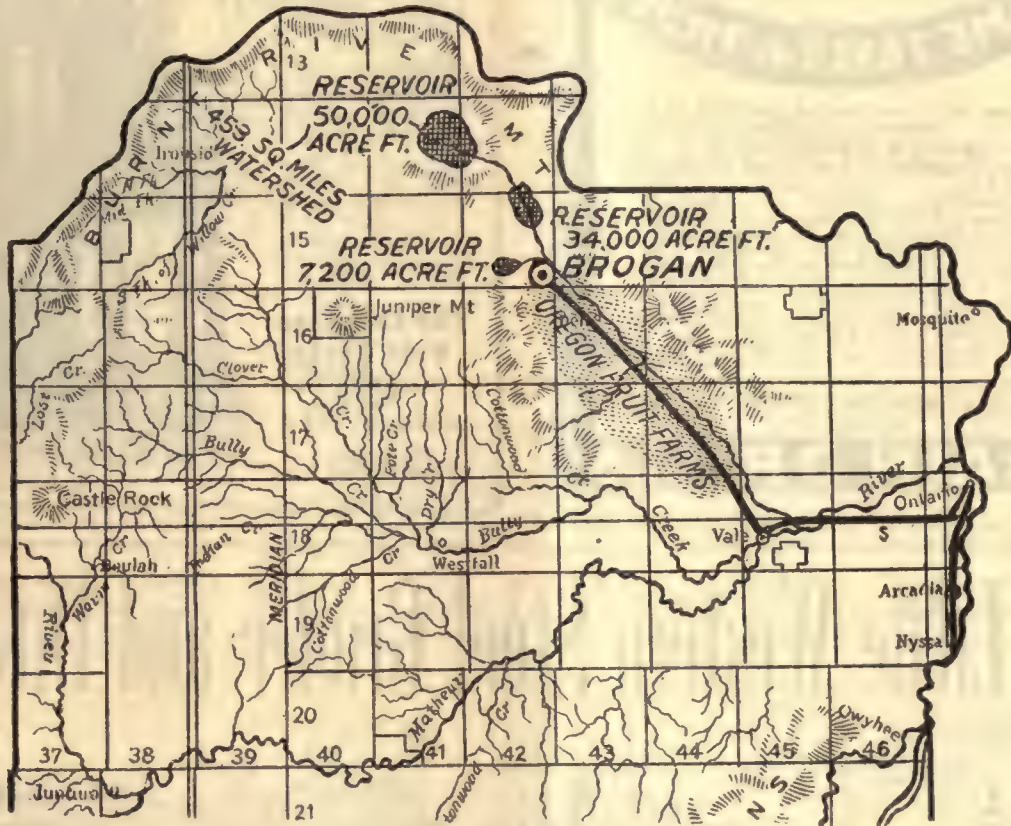
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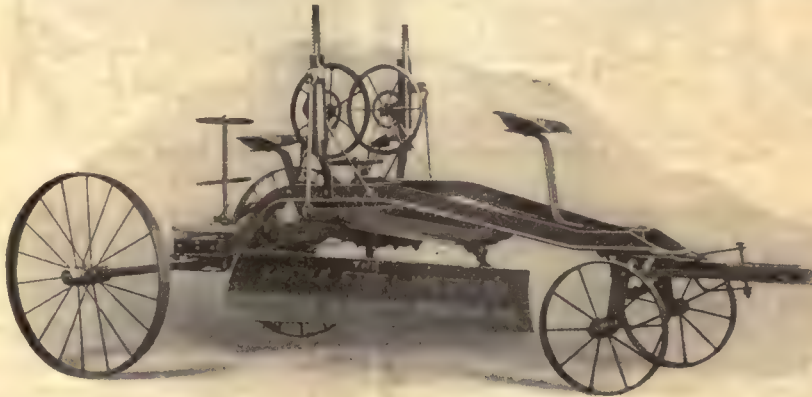
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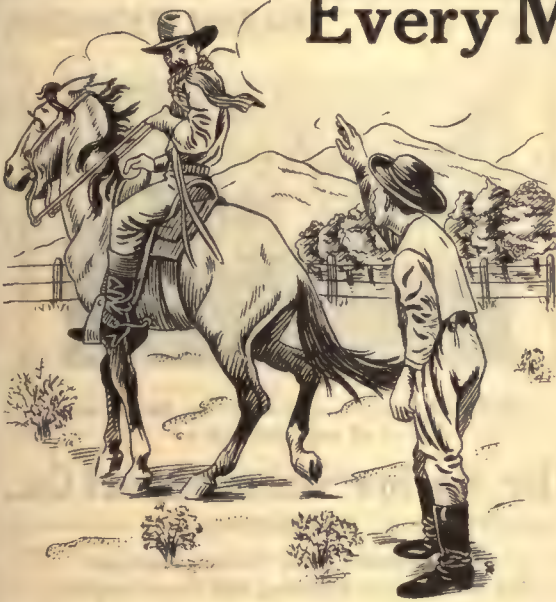
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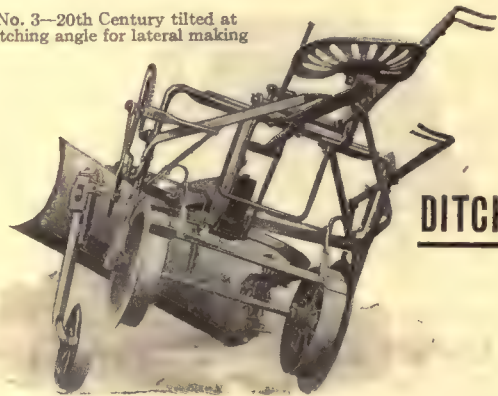
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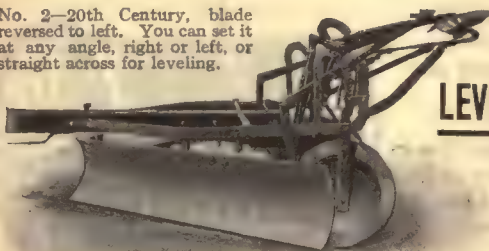
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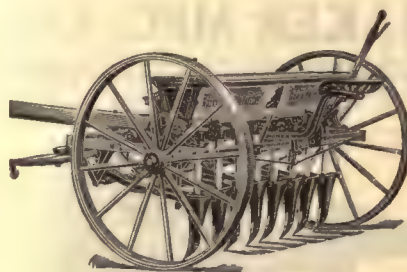
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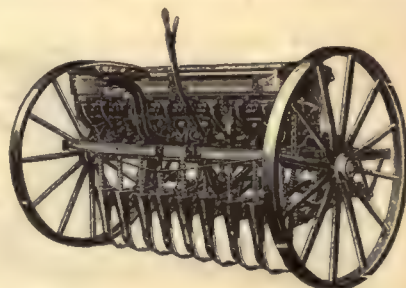
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THE IRRIGATION AGE

VOL. XXV

CHICAGO, APRIL, 1910.

No. 6

THE IRRIGATION AGE

With which is Merged

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THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 25 years old and is the pioneer publication of its class in the world.

Irrigation Age South-Western Office. THE IRRIGATION AGE has established an office in Los Angeles, California, from which it will hereafter receive a regular news letter relating to the entire south-west, including Texas. This southwestern office is established because of numerous suggestions within the past year or two from prominent irrigators in Texas, concerning the matter of devoting more space to the southwestern section of the United States. At a later date the AGE will have direct representation in Houston or San Antonio.

Railroad Penetrates Central Oregon. With the great railway development which has been inaugurated in Oregon, an immense territory, embracing thousands of acres of valuable agricultural land, will be brought into the market. It is reported that the Hill interests have engaged to build a line from the Columbia River, along the Deschutes, as far as Bend, Oregon, and it is supposed that, if the line is built to this point, it will be extended at a later date to some port on the Pacific coast.

It has always been well known that central Oregon is one of the most delightful sections in the United States. Excellent soil, ample supplies of water, favorable climate mark this area as one of the best in the entire country.

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a trip overland, through Oregon, within the next sixty days, starting in at the Columbia River, and arriving at some point near the Klamath lakes. A story of this trip, with illustrations, will be published in future issues of THE IRRIGATION AGE.

Something Besides Industry Is Needed.

Professor Ernest D. Bishop, a prominent educator in the city of Chicago, has resigned his position and will move his family to a western irrigated ranch, where, he tells one of the leading daily papers of this city, he can do much better than on his former salary. He states that he will go west and take up a farm where members of his family may become healthy in body. Fourteen years as instructor in the public schools have exhausted his health and strength. Professor Bishop wants his boys to go to college, and if he succeeds as a western farmer or ranchman, he may realize his wish.

While the professor, in his interview, is highly optimistic, he must not overlook the fact that sufficient funds are needed to insure a comfortable support for his family until his first money crop matures. Many people who are desirous of going west do not consider that it requires more than air and water for existence. That is why a small per cent of those who go into the west fail to succeed.

If the professor has \$1,000 or \$1,500—enough to equip a moderate sized ranch and support his family for

one year, or until the second year's crops are ready for market—he may go west with safety. Perhaps he may be resourceful enough to start with less money, but it is a dangerous venture for a man who has a family of five dependent upon him.

His story illustrates clearly the ambition of thousands of others, who feel that they are being held down by conditions beyond their control. His salary, while ample to insure a respectable living for the family, is not great enough to allow him to lay up a sufficient sum to make him independent in later years. It is also true that some of the most successful men in the west today went into that county in a "dead broke" condition, and have done better than would have been possible had they been well supplied with money.

Necessity makes a man inventive. It teaches him to study further into the future, and in wider scope, than if he has sufficient means to live comfortably for a given time; but necessity also frequently works a hardship on other members of the family. This is not a condition to be desired by the average parent. A man may go hungry himself, but he dislikes to see his children or relatives suffer.

We would say to the professor, in all liking, to wait until he has sufficient funds to insure a reasonably comfortable living for at least one year. The call of the west is strong, but it lures to pitfalls unless reasonable precautions are observed.

Pueblo Solves Congress Problem. With the various committees working in harmony and along practical and well organized lines, it can be predicted at this time that the Eighteenth National Irrigation Congress will excell all others in both point of attendance and importance to the irrigation world. Under the able direction of Director of Publicity R. H. Faxon, the next congress is already being widely advertised. It can be foretold that Mr. Faxon's campaign will gather in strength with each succeeding month, and that the remote corners of the country will be awakened to the recognition of the Eighteenth Congress as a movement of national scope and importance.

Refusing to travel in the beaten ways of former congresses, the Board of Control has planned a somewhat unique but nevertheless successful method of soliciting funds to defray running expenses. Each county in Colorado is solicited for a contribution to the fund with the understanding that such donation will insure space near the convention hall for a display of the county's products. An auditorium will be set aside where counties may exploit their products through lectures or demonstrations. Mr. Watson, vice chairman of the board, is now making a trip through the state in the interest of this plan, and his reports indicate excellent success. He is of the opinion that the major

portion of the \$50,000 needed for expenses may easily be raised in this manner.

There will be a great opportunity, during the time of the show, to bring visitors from remote sections in contact with some of the large irrigation projects along the Arkansas River, and at other points adjacent to Pueblo. Excursion trains will be run for the benefit of the delegates to the more important points, as well as to some of the scenic resorts nearby, including Pike's Peak, Manitou, the Garden of the Gods and the Royal Gorge.

Beaman Scores Conservation Congresses. In a recent article in the Denver Times Judge Beaman, of Denver, declares that until the present time nothing has been done at any conservation meeting anywhere that a meeting of coyotes could not do—that is, howl. The judge says that neither he nor others are looking for advice as to how to run their business, and that if they were they would not apply to members of the conservation committees, as it is obvious that the information there gained would be impracticable. In explanation of his attack upon the present status of the conservation movement, the judge says, among other things, that nothing has been done at any conservation meeting held in Colorado, or elsewhere, that is of sufficient importance to attract the attention of thinking people, nor does he believe effective work will ever come from those now engaged in the movement, or by the methods pursued.

He states that not long ago Professor Eliot, President of the National Conservation Commission, declared that the Alaska coal, which he estimated at 15,000,000,000 tons, was the future coal supply of the nation. The judge shows that the Government Geological Survey reports, for 1907-1908, prove that in the Grand Mesa, Colorado, alone there are 20,000,000,000 tons of coal, and that in the whole state of Colorado 600,000,000,000, or forty times what Professor Eliot credits to Alaska, and that in the United States, exclusive of Alaska, there are 2,200,000,000,000 tons. The same report gives the annual coal consumption of the United States at 500,000,000 tons. Judge Beaman concludes that, discounting our supply 50 per cent, we have enough, outside of Alaska, to last 1,100 years, and it is reasonably certain that long before that we will be getting our heat and power from other and cheaper sources.

The fact of the matter is that the conservation movement as engineered was intended simply to strengthen the position of the former dictator of forest and land conditions throughout the west. He hoped to so strengthen himself that his advancement to the Secretaryship of Agriculture would be an easy matter. As is well known, however, he has stubbed his toe.

**Lurid
Press
Attacks
Ballinger.**

Since the supreme law-making body of this country, through a tribunal the fairness and integrity of which no man has had the hardihood to impugn, has instituted an investigation into the so-called "Ballinger-Pinchot controversy," the AGE

has deemed it unwise to comment at length upon the subject, preferring to await the conclusion of testimony.

It is, therefore, with reluctance that this journal feels an imperative call at this time to make an authoritative statement upon a matter which, while foreign to the affairs under investigation, must nevertheless exert a direct and powerful influence upon the public mind. It is only after rigid investigation and careful analysis of facts as presented that the AGE enters its protest against distortion of facts by the daily press.

In the columns controlled by a certain news syndicate there recently appeared an article purporting to set forth the facts relating to an opening of Indian lands under the Yuma project in California. This article contained a venomous attack upon the actions and motives of Secretary of the Interior Ballinger in this connection.

It is useless to discuss at this juncture questions of journalistic ethics; a certain amount of pandering to popular prejudice and of a desire to truckle to the misinformed may, perhaps, always be expected, and in the busy course of human events must pass unnoticed. It is not to be assumed that a statement of the exact facts as gathered from official records can have any possible influence upon the current of events at Washington, nor would this article be permitted to make its appearance at this time were such an outcome to be apprehended.

The broad dissemination, however, within a recent period of the scurrilous story referred to can hardly, in the light of its author's preliminary utterances and of the affiliations of its sponsors, be regarded as mere coincidence. The people who have had the manhood to attack the present administration—rightly or wrongly—in the open and with evident sincerity, and whose knowledge of western conditions is not gleaned entirely from the pages of romance, might well pray "to be delivered from their friends."

The "Leitmotif" of the story is Secretary Ballinger's order "to disregard the line"—in flaming headlines—the "line" being that, to Western people, well—or, rather, evilly—known "line" of strong-arm "pushers" and freaks of endurance which in the past has managed to monopolize every good opportunity of this kind, to the total exclusion of those physically weaker or unprepared from business or financial reasons to "camp out" in the streets for a month's time and to hire substitutes to "hold a place for them." The editor of this journal may be pardoned if he pronounces himself

sufficiently in touch with western land laws and conditions to pass judgment upon the relative merits of the "line" and of the method inaugurated by Secretary Ballinger for throwing open the "Yuma" lands. No fairer method could have been devised for giving all qualified applicants an absolutely equal opportunity than that used. It is but justice to state that Mr. Ballinger is entitled to commendation for having banished the old "line," with its attendant evils, and for having substituted a method in consonance with modern ideas of fair play and justice.

The AGE during the past month, with full realization of the importance of the episode, has instituted a searching investigation of its own, and in another column is enabled to present to its readers FACTS, authenticated by a reproduction of official orders and records.

Private Projects Absorb Millions.

Private enterprise is in the ascendancy. Five years ago the Government's Reclamation Service strode in such giant steps that the individual was but a pygmy in comparison, and, as he plucked off his small million-dollar project, he gazed in sheer and unconcealed admiration at federal engineers who dared engage in mighty works where hundreds of thousands of acres were the stakes and numerous millions in dollars must be the cost.

But what a change has developed in the last decade! How has this underling waxed strong and stronger until, from the high eminence of success, he looks down upon his fellow toiler—yet craves no \$30,000,000 in added funds to retain his seat or maintain his personal integrity.

Within the past thirty days news reports have confirmed the successful organization of two private enterprises which, if combined in financial proportion, will alone equal nearly one-half the entire expenditure of the Reclamation Service from the day it was created until the year 1910. The American Falls project of the Buhl syndicate, and the Southern Colorado Irrigation Company, backed by Dal Deweese, Samuel Brown, Jr., and others, are but forerunners of the several giant companies that are now in process of formation and that may announce a formal existence within a few months.

Yet with all this procession of huge concerns, there is a retinue of smaller and less conspicuous enterprises that are contributing in even greater proportion to the development of the irrigated west. A glance at the columns of Reclamation Notes and New Incorporations, as presented monthly in the AGE, is sufficient proof of the remarkable activity in irrigation affairs. Each new project seems to act as a spur to others, and were it not for the almost boundless areas of arid land it might

well be predicted that a score of years hence every acre will be reclaimed to cultivation.

Experiments in underflow pumping are now being pursued along such consistent and successful lines that it may be prophesied that the pump will one day play a most important part in the irrigation field. Government Surveys are besieged with requests for investigation to determine source and reliability of underflows in various parts of Texas, New Mexico, Colorado and Kansas. Community interest has been awakened, and from Dakota to California—in every state of the west—pumping plants for individual or co-operative use are being installed.

There is no clearer indication of the favor that attaches to irrigation bonds than is found in the fact that issues are readily handled by the bond selling houses of Chicago, New York and other commercial centers. It is only through the popular demand for these securities that mammoth irrigation companies may be formed. Reports from bond sellers show that there is no abatement in the sale and that the tone of the market is strong and well based.

Co-ordinate in importance to the steady demand for irrigation paper is the gradually increasing inquiry for information relating to the conditions under which land may be acquired, the cost of building, tools, production of crops and markets for products. Wage-earning members of the community are watching with interest the reports of a friend who has gone west to take land in an irrigation project. Each is, perhaps, convinced of the need for change from his present mode of living, but, with a family dependent upon his efforts, fears to face a change in life until he has learned the truth through a personal acquaintance.

It is well that the west is alive to the time-signs and is preparing for the vast exodus of people from the east to happy homes amid the flowers and sunshine. In this prospective change lies the solution of the much-mooted question as to the cause of the high cost of living, and the American people are not slow to reach the obvious conclusion.

By the terms of its charter, the Minnesota River Improvement and Power Company, with headquarters at St. Paul, Minn., has authority to drain and irrigate lands on the Minnesota river or its tributaries. Among the directors are Wm. H. Gold of Redwood Falls, H. Soreline of Granite Falls, Dr. L. A. Fritchie of New Ulm and Geo Atchison of Mankato.

Farmers near Douglas, Ariz., are instituting tests for pumping water for irrigation purposes. In Sulphur Springs Valley, near that city, experiments will be conducted with a view to determining what supply is available. In the event these are successful, many pumping plants will be installed. Geo. Turvey, four miles west of Douglas, has already demonstrated the practicability of the plan, and experiments will determine whether or not the underflow is adequate at other points.

YUMA OPENING

Facts Relating to Secretary Ballinger's Ruling on Entries—Stops Strong Arm Method and Insures Fair Play.

[In our editorial columns appears an article bearing upon the recent opening of the "Yuma" Indian lands and the method inaugurated by the Secretary of the Interior to ensure a fair disposal of these valuable lands, and which were made the basis of a recent newspaper attack upon Secretary Ballinger. The "Age" has made the "opening" the subject of a searching investigation and it feels that it is doing a real service in presenting an impartial statement of the actual facts.]

The Yuma project is situated in townships fifteen and sixteen south, range 23 east, of the San Bernardino base and meridian in the extreme southeastern corner of the State of California. The lands being a portion of the Yuma Indian Reservation, authority to dispose of them under the reclamation act of June 17, 1902 (32 Stat., 388), was granted by the twenty-fifth section of the act of Congress of April 21, 1904 (33 Stat., 224).

It having been ascertained that water could be furnished for this project during the irrigation season of 1910, notice of the opening was issued by the Interior Department January 12, 1910, which notice provided that homestead entries could be made at the local land office at Los Angeles, on and after March 1, 1910, beginning at 9 o'clock a. m. This notice did not specify in what manner or order applications would be received and disposed of otherwise than as regularly prescribed by the Federal Statute and Regulations, as it was not supposed there would be any unusual demand for the lands. On February 18th, ten days before the opening, the register and receiver of the land office at Los Angeles wired the General Land Office that a line was then formed for the Yuma opening, of which the police had assumed charge and issued numbers to parties holding places in the line, and requested authority to recognize the persons holding such numbers as entitling them to make entry, provided they retained places in line until the day of the opening.

It thus became apparent that there would be much greater demand for the lands than had been originally anticipated. The land office at Los Angeles is in a large commercial building situated in an active business center of the city; the line of two or three hundred people, which was regular and orderly on February 18th, would undoubtedly become disorganized and uncontrollable when it reached as many thousand on the day of the opening, and, as ten days would elapse before such opening, the confusion which would naturally arise if the order of application were permitted to depend upon numbers given out by the local police, over whom the Federal officers could exercise no control, can be readily understood. Serious difficulty and personal controversy, in some cases even extending to bloodshed, has heretofore been experienced in making the order in which persons might present applications to enter public lands depend upon the physical strength and endurance of individuals seeking opportunity to make entry.

Furthermore, the prospect of the purposes of standing in line at the Los Angeles land office being entirely defeated by parties going directly on the lands and between 12 o'clock midnight on Feb. 28th and 9 o'clock a. m. on March 1st making actual settlement with a view to acquiring preferential right to the respective tracts of which physical possession was acquired was suggested; such procedure would have given rise to inevitable conflict between the party filing application for a given tract and the person in possession thereof and establish a fruitful source of personal conflict involving probable breaches of the peace and legal controversy which would have indefinitely delayed development.

It was to avoid these difficulties and obtain an orderly disposition of the matter that on February 19th the register and receiver were instructed to disregard the line and numbers assigned by the police and secure the Shrine Auditorium, or some other suitable building, for March 1st, the doors of which should be opened for the admission of applicants between the hours of 8 and 9 o'clock a. m., when the doors were to be closed and locked, all applicants then present identified, and authorized to file applications on or before a given date (later fixed as March 19th), the applications so filed to be treated as simultaneous. It was further directed that where two or more applied for the same tract, direc-

tions would be given as to how the priority of right between such conflicting claimants should be established.

Said telegraphic instructions were supplemented on February 24, 1910, by detailed directions as to the means whereby parties filing conflicting applications might, if possible, agree among themselves as to which one of them should make entry, and, in case of failure to agree, the choice would be determined by lot.

The Yuma project embraces only 174 farm units; 2,800 applicants, or about 17 for each unit, received identification cards at the Shrine Auditorium on March first, and, before the close of business on March 19th, 1,727 applications, or about 10 for each tract, were formally tendered.

Under the plan adopted by the Interior Department on February 19th, all rush and scrambling, and the public confusion and disorder necessarily incident thereto, were avoided; the weak were placed on an equal footing with the strong, tedious and unnecessary waiting was eliminated, and each of the applicants afforded an equal chance of securing a tract. The course pursued in this instance is in conformity with that adopted on previous occasions when large numbers of people congregated with a view to making entry of public lands, and, as heretofore indicated, is the result of experience involving grave disorders, contentions and controversies naturally incident to strife for precedence in opportunity to acquire what is considered valuable property.

For further information, we reproduce copies of the public notice of January 12, 1910 (which relates to matter in hand), of the Secretary's telegram of February 19th and of his in-

DEPARTMENT OF THE INTERIOR.

WASHINGTON, D. C., January 12, 1910.

Public Notice.

Pursuant to the provisions of Section 4 of the Reclamation Act of June 17, 1902 (32 Stat., 388), notice is hereby given as follows:

1. Water will be furnished from the Yuma project, California, under the provisions of the Reclamation Act, in the irrigation season of 1910, for the irrigable lands shown on farm unit plats of Ts. 15 and 16 S., R. 23 E., S. B. M., approved December 13, 1909, by the Secretary of the Interior, and on file in the local land office at Los Angeles, California, and the lands will be opened to entry and settlement in accordance herewith.

2. Warning is hereby given that no person will be permitted to gain or exercise any rights whatever under any settlement or occupation begun prior to March 1, 1910, on any land covered by this notice, and all such settlement or occupation is hereby forbidden.

3. Homestead entries accompanied by applications for water rights and the first instalment of the charges may be made at the local land office in Los Angeles, California, on and after March 1, 1910, beginning at 9 o'clock a. m., under the provisions of said act, and the act of April 21, 1904 (33 Stat., 224), for the farm units shown on said plats. Water-right applications may also be made for lands in private ownership, and the time when payments will be due therefore is hereinafter stated.

4. The limit of area per entry, representing the acreage which in the opinion of the Secretary of the Interior may be reasonably required for the support of a family on the lands entered subject to the provisions of the Reclamation Act, is fixed at the amounts shown on the plats for the several farm units.

DEPARTMENT OF THE INTERIOR,

WASHINGTON.

February 19, 1910.

TELEGRAM.

Register and Receiver,

Los Angeles, California.

Disregard line and numbers assigned by police. Secure Shrine auditorium, or some other suitable building, for March one and open its doors at eight A. M., for admission of Yuma applicants. Close and lock doors promptly at nine A. M., and take name, address, age, height, weight, and signature of all applicants then in auditorium, and later and before close of business on March tenth, nineteen ten, receive and suspend their applications. Where two or more apply for same tract, such applications are to be considered and disposed of as simultaneous and directions will be given by mail for determining priority of right between conflicting applicants. Give all possible publicity to this order.

Ballinger,

Secretary.

DEPARTMENT OF THE INTERIOR,

WASHINGTON.

February 24, 1910.

Register and Receiver,

Los Angeles, California.

Sirs:

Paragraph 2 of the public notice dated January 12, 1910, heretofore given, of the opening of the lands within the Yuma irrigation project, which become subject to entry at your office on March 1, 1910, is hereby amended to read as follows:—

"No person will be permitted to gain or exercise any rights whatever under any settlement or occupation begun prior to April 1, 1910, and all such settlement or occupation is hereby forbidden."

For the purpose of assuring the orderly opening and equitable distribution of said lands, you are here directed and authorized to secure for use on that day an auditorium, or other suitable building, or a suitable and adequate enclosure within which prospective applicants for these lands will be permitted to assemble prior to nine o'clock, A. M., on March 1, 1910, but no applicant will be permitted to enter the auditorium, building, or enclosure secured for that purpose, after that hour.

When the assemblage of applicants has been thus formed and segregated, you will place guards to prevent other persons from joining the assemblage after nine o'clock, and at once distribute to each of the assembled applicants a card printed with blank spaces suitable for the signature, postoffice address, age, height, and weight of the applicants; and, when these cards have been filled out by or for the applicants, and signed by them, they will thereafter be returned to you by the applicants before the assemblage disperses, and be later used by you as a basis and means of identification when applications to enter are presented.

All qualified persons who thus present cards will be permitted to file their applications to enter at your office at any time between nine o'clock, A. M., and four thirty o'clock, P. M., of each day, Sundays excepted, up to and including March 9, 1910; and all applications thus filed will be considered and treated as filed on March 1, 1910, at nine o'clock, A. M., and will be suspended by you until March 10, 1910, when you will proceed to take early and appropriate action thereon in the following manner:

You will first carefully examine all applications so filed and suspended, and assemble the applications of all persons who have applied to enter the same farm unit, into one group, and consider them as having been simultaneously presented. Notices will then be at once given to all qualified applicants in each of the groups thus formed, by mailing such notice to each applicant directed to the address given in his application, notifying them of a named hour on a specified date when they will be permitted to appear at your office for the purpose of mutually determining among themselves the method by which one of them will be awarded the right to enter the tract which they have all applied for, and if they fail to mutually agree on such a method you will award the right of entry to one of them in the following manner: The name of each qualified applicant for the same tract who appears at your office at the hour named, either in person or by a duly appointed agent, will be written on a separate small card, and each of these cards will be then placed in a separate sealed envelope which bears no distinctive marks and which is the same size and color of the envelopes in which the other cards are similarly placed. The envelopes thus containing the names of all qualified applicants for the same tract, who appear under the notice, will then be placed in a receptacle, and, after they have been thoroughly mixed, some person selected by the applicants for that purpose, or by you, if the applicants fail to make a selection, will then draw one of the envelopes from the receptacle in such a manner as to prevent him from seeing any of the envelopes at the time he makes the drawing, and the qualified person whose name is contained in the envelope thus drawn will be awarded the right to make entry of the tract for which all the applicants have applied, and the applications of the remaining applicants for the same tract will stand finally rejected. The applicants who fail to appear either in person or by agent at the hour named in the notice will thereby forfeit all rights under their applications.

Persons who present cards as above specified will not be required to present applications for water rights, or to make the necessary payments at the time they file their applications to enter; but in all cases where you find that any qualified person is the only applicant for the farm unit covered by his application, and in all cases where a qualified applicant has been awarded the right to enter a farm unit for which there were other applicants, you will notify such applicants entitled to make entry that the right of entry will be denied them and their applications rejected if they fail to file the necessary water right applications and make the necessary payments within ten days after the date of such notice, and in all cases where such applications are not so presented and the required payments are not made within that time you will reject the applications to enter and permit the lands covered thereby to be entered by the first qualified person who applies therefor.

All applications to enter said lands presented otherwise than as hereinabove specified shall be by you suspended and be proceeded with in regular order after the applications hereinbefore provided for are disposed of.

Up to and including March 9, 1910, you will keep plats of all farm units subject to entry, publicly exhibited in your office; and, as soon as any application to enter has been filed, you will place a check mark or other distinguishing mark on the plat of the unit embraced in such application, for the purpose of enabling subsequent applicants to readily ascertain what units have been already applied for and the number of applicants for any specified unit.

Former soldiers and sailors may file declaratory statements for these lands as in the case of other public lands subject to homestead entry, provided, however, that in no proceeding provided for herein shall any person act as agent for more than one soldier or sailor seeking right of entry to any of said lands; but, when declaratory statements are filed by persons who present cards on March 1, 1910, as herein prescribed, such declaratory statements will be suspended and thereafter treated in the manner herein provided for the treatment of applications to enter, but no declaratory statement must be finally accepted until the necessary water right application has been presented and the required payments have been made.

Very respectfully,

R. A. Ballinger,
Secretary.

ARID AGRICULTURE

BY

B. C. BUFFUM, M. S.

Manager of the Wyoming Plant and Seed Breeding Company, Worland, Former Professor of Agriculture in the University of Wyoming and the Colorado Agricultural College, and Director of the Wyoming Agricultural Experiment Station.

We are publishing in this issue the first installment of a series of articles by Prof. B. C. Buffum, Manager of the Wyoming Plant & Seed Breeding Company, of Worland, Wyoming.

The author was formerly Professor of Agriculture in the University of Wyoming, and the Colorado Agricultural College, and was also Director of the Wyoming Agricultural Experiment Station.

Prof. Buffum is one of the best known authors on arid agriculture in the world, and has handled this subject in a masterly way in manuscript, from which these articles are reproduced.

DRY FARMING.

The term "Dry farming" is often objected to because it states an untruth. No crop can be produced without moisture. Dry farming means farming where the annual precipitation has not been considered sufficient for the production of profitable crops. Indeed, dry farming is usually carried on where the rainfall of one season is not sufficient and the moisture must be saved up for a longer period.

Perhaps dry farming is as good a combination as can be invented to specify this kind of agriculture. At any rate, no other term has been suggested which covers the practice and is not more objectionable. To designate it as Scientific farming is not good, for farming is an art. Science is as useful, if not as indispensable, to other forms of agriculture. Scientific farming has been used also to designate the semi-arid cropping along the border of the region of sufficient rainfall. Arid farming is a most excellent term, but it has a broader meaning. As here used arid agriculture covers the whole subject of production from the soil in the states where aridity prevails.

The raising of crops without irrigation in a dry country is not new.

In some parts of our own country, farmers have been self-supporting on farms which receive less than fifteen inches of rainfall per year, for almost a half century. The general introduction of dry farming to all sections of the west is a new movement. Men of little faith, with much prejudice and less information, have raised their voices in most vigorous protest wherever the new system has been introduced. Some of this opposition is righteous indignation over the exaggerations of dry farm enthusiasts and land agents. Regardless of such opposition, dry farming has met with such degree of success everywhere that it not only holds its own but is spreading rapidly. Many are quick to claim that the successes are due to excessive moisture, but with the use of the two year conservation method the normal rainfall is repeatedly proven sufficient. It is now safe to predict that the system has come to stay and that a considerable portion of our range land will be made to produce more profitable crops than it does in native grass. Many stockmen are wisely trying cropping on a small scale. It is undoubtedly true that many new settlers who think they already "know all about farming" are destined to fail, but the few will learn how and practice well what they learn. Unless in unsuitable locations, these men will stick. There are enough favorable locations and it is safe to say that the art of dry farming is permanently established.

The key to dry farming is the conservation of moisture and making it available to the growing crop. All the operations of soil culture and plant cultivation are carried out with the object of storing moisture in the soil and making use, through the crop, of all that can be saved. The tillage

which is carried out to perfect the use of the water supply does other things which increase fertility and favor the growth and maturing of plants.

The principle then, upon which dry farming depends for its success is the catching, storing and saving of enough moisture in the soil, to secure a crop. The method by which this is done includes some special attention to all the factors of tillage, as plowing, planting, harrowing and cultivating. So the dry farmer must possess and use advanced information of principles and practice. The system which is generally carried out is to conserve two years moisture for one crop. By this system one-half of the land is cropped each year, while the other half is summer tilled. In favorable seasons, or by the use of certain combinations, it is often possible to obtain two crops in three seasons. No doubt there are drouth resistant crops which can be made to produce, every year, in favorable locations. After a crop is removed from the soil and the land is again put in condition to absorb all the moisture that comes, should there be heavy rains, it may be put into winter grain or again planted to spring crops the following season. The soil culture and crop treatment followed must be carried out at the right time and in the right way to insure the greatest success.

One man with a small amount of extra help should be able to farm at least 160 acres by the summer tillage system. How much land can be used to advantage depends on the kind of farming, knowing how to take advantage of conditions, having the proper equipment and other things. We have two opposite conditions in the arid region. The small farm unit is most profitable for pure farming under irrigation. The large farm unit is important to the dry farmer. Every man should have double the land he has in crop and at least as much more for stock pasture. A section of land would secure a more certain livelihood than smaller holdings, and half section farms where no water is available for irrigation are as small as should be acquired by the average farmer, over a large section of the dry farm country.

It does not require any new, complicated or expensive machinery with which to follow out the most successful methods of dry farming. Ordinary tools may be used, but having them is absolute necessary. The bricklayer would make a sorry job of laying up a wall without a trowel. No man should attempt to do any kind of farming without proper equipment. The dry farmer ought to have the following list of tools:

- Four or six horses.
- Three section drag harrow.
- A two gang plow, twelve or fourteen inch.
- A single walking plow.
- A good disc harrow (14 inch disc best).
- One or two good cultivators.
- An Acme harrow.
- Wagon and hayrack.
- Mowing machine.
- Two sets of harness.
- A Press drill.
- Potato planter and digger.
- Harvesting machine.
- An alfalfa harrow.
- A weeder.
- A float or drag.
- The necessary small tools.

The best paying dry farms will be those in which a system of cropping and feeding stock is combined. Where the crops are fed to stock on the farm and the manure and waste returned to the land, the loss of soil fertility is so small that we need take no account of it. In fact, while there is an actual loss of plant food from the soil, so much of the natural stored plant food is made available that the producing power of the soil continually increases. The plant food elements used up when a crop is fed to hogs is only 15 per cent, and when fed to horses, cattle or sheep it is only four or five per cent of the total. The balance is left in the manure and may be returned to the soil. The manure is a very important item also, to be added to arid soils, as it increases their vegetable mold, making them very retentive of moisture and helping the work of soil bacteria and chemical agents.

We would suggest also that many of the grains raised for stock food may be cut and fed without threshing, which avoids the extra work of threshing and hauling to market.

There are great opportunities in the arid region on account of our market facilities, our favorable climate and the natural richness of our stock foods in protein, for the building up of profitable stock feeding industries. The feeding of lambs is already of much importance, and there is hardly a location in which the raising and feeding of hogs, principally of the bacon type, cannot be made highly profitable. Poultry properly managed always give good returns. Many dry farmers also will have the use of more or less adjoining range for the pasturage and partial support of their stock.

Not all soils are suitable for dry farming. Unless a soil is sufficiently deep and sufficiently retentive of moisture, or can be made so, to store the water that falls on it from one season to the next, it will not be a good soil for this system of farming. The soil must be looked upon as a reservoir for water. If the reservoir is too shallow or too hard the storm water will not soak into it. If it leaks at the bottom or cannot be so protected that too much of the moisture will not be lost by evaporation from the top, attempts to reclaim it will meet with failure. Many of our soils are hard or compact at the surface in their natural state, but may be made to absorb all the moisture that comes by a single plowing. Heavy, compact clay absorbs water slowly, and loses it rapidly by evaporation. Such a soil, especially if underlaid with a shallow hardpan, should be avoided. Sandy loams are the best soils, and the more sandy they are, as a rule, the more retentive they are. They will hold water better if they contain a supply of well decomposed vegetable mold. Such soils two or more feet deep can usually be successfully worked, other conditions being favorable. We believe it no detriment if the soil is underlaid with pure sand or small gravel, unless such sand or gravel contains cement which makes it hardpan.

Sandy soils are kindly soils. They are easy and pleasant to work. They give the farmer time to get around to his necessary tillage operations. There is little danger of working such soils too wet and practically none of injuring them by puddling when too dry. Heavier soils may do if they contain enough lime so the soil particles are well "flocculated." Lime is usually abundant in western soils. Heavy soils may be all right if they contain a sufficient amount of vegetable matter. Dry soils are usually deficient in humus and decomposed vegetable substances.

Flocculation is the collecting together of the very fine particles of soils into bunches or little flocks. An ounce of fine soil may contain over 500 billion particles and if each particle remained by itself, plant roots could not feed in the soil. Lime seems to bring the fine particles together and makes the soil sufficiently granular to be worked. Vegetable mold serves the same purpose, by keeping the soil particles farther apart.

A new farmer who is in doubt about selecting his soil, or what to do for it, should get the advice of some reliable man who has had experience.

There are three great personal elements of character not possessed by the unsuccessful farmer. They are, first, the know-how. Second, the do-it-now. Third, the do-things-well. So many let their work crowd them. They do not do so well as they know. There is often unavoidable neglect to do important things at the right time. More is generally attempted than can be done. The results arising from lack of these traits in the man, are often laid at the door of natural conditions that are in no wise responsible.

There are exceptions to all rules. Our story of the methods for dry farming practice will need to be modified in detail to meet the particular conditions of each farm. The farmer's ultimate success depends on knowing the principles and then intelligently applying them to his individual problems.

(To be continued in May number.)

It is reported that W. C. Green and associates have appropriated the waters of the Gila river at Florence, Ariz., and will construct a canal for irrigating lands in the Casa Grande Valley. The ditch, proposed for construction by Mr. Green, will parallel that of the Casa Grande Canal Company. A dam will be constructed at point of division.

Why Deserts Bloom

BY DON FARNSWORTH

II.

LOCATION AND EXTENT OF ARID AREA.

Between the 100th and 122d meridians lie 1,250,000 square miles of territory, embracing fourteen states and two territories, nearly one-half of the entire area of the United States. Within this expanse is the arid region. Here and there are oases, but the major part of this whole region of 800,000,000 acres depends upon irrigation for its products of agriculture. About one-half of this land still belongs to the Federal Government.

Climate.—Climatic conditions in such a vast expanse of territory are essentially varied. The characteristic common to all localities within the arid limits, necessitating a radical departure from the methods employed in agriculture in the humid states is the aridity of the climate, the lack of rain-fall.

Precipitation varies in the arid region from two inches to twenty-four inches per year, and in most of the states the rain comes in winter, a time of year when it is least needed. In sections of Arizona the average rain-fall is not more than two inches annually. In the farming sections of Idaho, it is from twelve inches to fifteen inches; Southern Utah has an average of six inches; Central California, the section included within the arid region, the rain-fall varies from ten inches to fifteen inches; Colorado has from ten inches to fourteen inches.

The Soil.—Chemical analyses show that the soil throughout the arid region is of exceptional productivity. Many tests show it to be superior to that of our eastern valleys. With rich soil and swollen mountain streams and rivers within reach, all that remains to be done to convert the arid lands into "green pastures" is to bring the soil and water together.

Methods of Reclamation.—Three principal methods of reclamation now in use in the west are irrigation by: (1) artesian wells, (2) power pumps, and (3) canal system.

Artesian Wells.—Artesian wells are utilized wherever found. Their discovery greatly enhances the value of the property, for the cost of irrigation is reduced to a minimum when nature pumps the water onto the land.

California, Colorado, and Utah are the great artesian well states of the arid region. The first two named have 6,000 wells each, while the Mormon state possesses nearly 5,000. Texas and Nebraska have between 4,000 and 6,000. In the whole arid region there are about 40,000 wells.

Some of the artesian wells are of enormous capacity, yielding from five to six million gallons of water a day, capable of irrigating over a section of land. The outflow from the greater number, however, is limited and probably not capable of irrigating more than five or ten acres. Two million acres is approximately the limit of irrigating capacity of the present wells, though no one can foretell the extent of nature's treasured blessings which may be poured out in the future. Recently several wells have been discovered in Montana, and experts predict that full development will prove it to be one of the greatest artesian well states in the arid region.

Pump Irrigation.—About one-half of the arid area is level prairie or table-land, and the other half is mountainous. For such irrigable land near the mountains, where access may be had to the mountain streams, canals can be operated to the best advantage. On the prairie where the mountain reservoirs are beyond practical reach, the water must be obtained from below the surface.

Underlying the arid areas at various depths are bodies and streams of water and seepage threading their way slowly through the porous sandstone and gravel to the sea. Where the impervious strata from synclinal basins near enough the surface, drillings will liberate the imprisoned waters through artesian wells, but where the geological formations do not so favor the agriculturist, other facilities must be devised to bring the precious water to the land.

To meet this demand every conceivable type of pump-

Send \$2.50 for the Irrigation Age 1 year, and cloth bound copy of the Primer of Irrigation

ing device, from the crude horse pump to the efficient steam and gasoline engines has been pressed into service. Some measure of success has attended the operation of many different mechanisms, in a number of small localities, yet multifold failures have resulted from the effort to secure an appliance for general utility on a large scale. The whole problem is to attain the greatest efficiency with a minimum expenditure. Most of the failures have come from gross miscalculations, and not from any inherent fault of the propositions. In spite of the pit-falls, success is going hand in hand with the genius of intelligent industry producing fair financial returns which foreshadows a still better day when methods of securing adequate water supply are more nearly perfected.

The Canal System.—As valuable as are the artesian wells and pumps, the one system that stands pre-eminent as a permanent and lasting means of reclamation is that of canals and reservoirs, for fewer of the uncertainties of hidden nature enter into their control. The great initial expense of their construction has been the chief obstacle in the progress of irrigation, but it is vastly superior to any other system because when once completed for a given area of land, it is permanently reclaimed.

Water supply from the mountain creeks is constant, as the snows of the mountains are much more regular than rain-fall in any part of the country. The cost of the maintenance of canal systems is nominal, if the ditches are carefully supervised and kept in repair.

A canal-system consists of a main canal, adjusted in dimensions to the area to be cultivated and the distance the water is to be conveyed by the lateral ditches running to the different parts of the irrigated area; and, of reservoirs in which the water is stored during the seasons of high water and from which it is distributed to the growing crops.

The engineering problem involved in building canals and reservoirs cannot be taken up in detail in this article. The cost is usually enormous and the investment of capital has been extremely hazardous. Losses have not been uncommon, and those incurred in this branch of irrigation have been more disastrous than in other branches, because of the large amount of capital necessarily involved. It is a significant fact, however, that wherever a loss has occurred it has been the builder of the canal and not the operator who has suffered. Lack of funds to complete the projects, or, if they have been completed, the pressing demands of creditors, have forced many a canal company into liquidation. However, once a system is completed, the rest is "velvet"; for records of failure where there is a good canal system under competent management do not appear in the arid region of the United States.

Applying Water to the Soil.—After the water has been brought to the land in some practical way, the chief methods of distribution are: (1) the check method, (2) furrow irrigation, (3) the basin method, and (4) flooding the field ditches.

The Check Method.—In the check system the land is divided into small subdivisions; (often five to ten to the acre), separated by ridges, and the water is let into different compartments, or checks at different times. This system gives best results on gentle flat slopes of sandy soil. Forage crops are best suited to it.

Furrow Irrigation.—Nearly all farms use this method to some extent, but its use is largely confined to the irrigation of fruit orchards and, in colder climates, to root crops. The plan is variously worked out in detail, but in general it consists of rows of furrows, three to twelve inches deep and three to six feet apart, running across the land at right angles to the feeding ditch. Water is distributed through these furrows from the main ditch. The chief objection to this method is that the furrows interfere with free farming operations.

The Basin Method.—This method is also used extensively in fruit culture. The trees are planted in rows, and earthen dykes, or ridges, are thrown up in cross rows between the rows of trees, enclosing each tree in a square basin. This arrangement enables the cultivator to water at one time as many trees as he likes.

Flooding From Field Ditches.—Of the 9,000,000 acres of land cultivated west of the Mississippi River, upwards of one-half are tilled by this method, which consists of

distributing the water over the fields through small field ditches, sixty to ninety feet apart, and spreading it over the land from openings made in the main ditch banks. In this way the farmer can take care of a large area.

This method is the best and cheapest for large farms, such as those in the Gallatin Valley, Montana, and throughout the Arkansas Valley of Colorado fifty per cent of the water used in the arid region each season is distributed by flooding from field ditches.

Development of Irrigation.—We are accustomed to thinking of irrigation in the United States as of recent development, yet nothing could be further from the truth. In Arizona and New Mexico there are well-defined remains of irrigation works that have outlived their type of civilization by many a century. Near Las Cruces, New Mexico, is a ditch that has been in constant use for over 300 years.

It is true, however, that irrigation, by English speaking people in this country, dates back only about fifty years. For its initiative, we must go to Utah where the little band of Mormon immigrants were compelled to adopt it to save themselves from starvation. And even at that time Brigham Young looked upon it not as a handicap but as a blessing.

Twenty-four years after the Utah work began, irrigation came into prominence in Colorado and California. The discovery of gold opened the valleys to settlers and the possibilities of irrigation were revealed to the unthinking miners who turned water onto the parched soil around their camps. In nearly every instance the work was begun without apparent consideration of future necessities.

As the miners and ranchers saw what water thus applied to the soil would do, they drifted into irrigation farming on a small scale. Irrigation works became enlarged and improved. Easterners saw the possibilities and began to take up the government land of the arid region; and so more and more of the arid land became cultivated in the more or less patchwork and haphazard ways of the settlers, until now we can see our present civilization standing on the threshold of the reclamation of a vast territory which ten years ago comprised what was known as the "Great American Desert."

Progress of the Canal System.—Small ditch of the pioneer. We have seen how the pioneer farmer constructed crude ditches leading to his land from near-by streams. That is the crudest example of irrigation in this country, and it required for its exploitation little or no engineering experience. A great deal of water was wasted, and while it sufficed for his small farm, it would not meet the requirements of a community in which there were several farms, for the water would not serve them all.

The Community Ditch.—With the advent of more settlers came the evolution of the community ditch, whereby several neighboring farmers united forces to build a common water course, with a mutual understanding that the expense of building and maintaining should be shared equally by all. Generally the only expense contributed to its construction was the farmer's labor. This system worked well under the then existing circumstances, but more than a mutual understanding became necessary when the proposition became so attractive that speculators and investors were brought into or sought the field.

Corporation Canals.—Again the eastern capitalist saw the possibilities in irrigation of the arid lands and millions of dollars have been invested in irrigation projects. For various reasons (all due to mismanagement and to no fault of the country or the proposition) several of the projects failed utterly and reduced many a wealthy man to bankruptcy. But on the other hand, many a man, formerly in mediocre circumstances, was made wealthy by these enterprises. Under the plan adopted, corporations were formed to build canal systems; waste lands were purchased; the works were constructed so that large tracts of government land, besides their own holdings, could be made fertile by the turn of a spade; settlers were induced to come and "take up" the public lands under the Desert Land Act, whereby any citizen may secure title to 320 acres by a specific amount of improvement and payment of \$1.25 per acre. The canal companies secured their profits in

(Continued on page 276.)

Spraying as a Business Science

Back in 1878, someone reasoned that if poison would kill people it would surely kill bugs, and if bugs were the cause of non-thriving trees and vegetables, why not place the necessary poison where the bugs could eat it—and die. Thus was evolved the great science of spraying, upon which the Government is now spending huge sums of money annually to help raise larger and more perfect crops of grain, fruit and vegetables. So came the first sprayer and its many successors.

But the science of spraying depends upon many other sciences for its evolution. Without the knowledge of insect and plant life gained from the study of the science of entomology, our efforts would be scattered and useless. Did we not first have a knowledge of the science of chemistry, it would be utterly impossible for us to have the proper solutions calculated to a nicety, and without the proper solutions thorough spraying is impossible. Necessarily, therefore, in

culture. Possibly its direct benefits have been surpassed by far reaching. A further impetus has been given to scientific research and the science set upon a most secure foundation. Interest and confidence have been instilled into those engaged in agricultural pursuits—interest in further developments—confidence in the scientific men who are working out agricultural problems.

The wise farmers of today make it a point to see that their spraying is done just as regularly and thoroughly as their plowing and planting and unless some unforeseen climatic conditions arise, their efforts are always rewarded with a perfect, heavy and money-bringing crop. Many a farmer is now making more money from a carefully planned, cultivated and sprayed ten acre orchard than he formerly cleared from his entire 200 acre farm. With apples of first grade selling at \$3 to \$6 per barrel, how can he help it?

A spraying outfit like the one in the illustration can be purchased for approximately \$275, and an immense amount of ground can be covered with it in one day. Perhaps the cost looks big to the beginner but when it is considered that trees can be sprayed at a cost of 1½c to 2c per tree and ten to some other discovery or development of a science, but its



Sprayer in Operation.

order to uplift the science of spraying, the Government must give corresponding attention to sciences upon which it depends and from which it emanates. All of the vast amount of money involved is merely an investment for future generations.

To any one who is at all interested in fruit, land or forestry, the value of all this research is at once apparent. Imagine for instance what would have become of California's citrus crop had not Prof. Woodworth after painstaking research discovered that he could control the white fly by an application of certain oily chemicals. And the white fly was ruining the citrus crop of California. It saved millions of dollars for California and directly affected the citrus trade of the entire world. Or, for instance, the discovery that certain proportions of lime and sulphur would make a mixture offering the only method of salvation to trees affected with the San Jose scale, the most pernicious and destructive little pest yet known to growers of fruit.

But what does all this mean to the American farmer? The universal recognition of spraying as a sure preventative marks one of the greatest steps in the advancement of agri-

culture upon the receptive natures of the American farmer is fifteen dollars received from one tree; as the Britisher said—"it doesn't look half bad."

BLAZER SPECIAL PUMP.

Something entirely new in form, but old in principle, is offered by the Humphryes Manufacturing Company in the Blazer Patent Spiral Pump.

Two interlocking spirals working in synchronism connected by cut gears and driven by a shaft in a suspension tube constitute the working mechanism. Perfect lubrication is secured by a column of oil maintained within the tube. All weight of the spiral impellers and water load is borne by ball bearings, thus reducing frictional losses and increasing the efficiency. Slippage is practically eliminated, and the pump, being in the positive pressure class, any speed in accordance with the requirements and within the pump's limits, can be maintained. It is the only pump possessing these features of the deep well class.

There is no suction or discharge pipe, the well casing performing these functions; all valves are eliminated.

The pump is now being manufactured in 8" and 12" sizes, with capacities of 500 and 1,000 gallons per minute respectively.

Full information will be furnished by the Humphryes Manufacturing Company, of Mansfield, Ohio.

THE CAREY ACT

How to Acquire Title to Public Lands Under the Act.

A Comprehensive Survey of the Regulations in Force in the Various States.

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(Member Executive Committee, Eighteenth Nat'l Irrigation Cong.)

V.

THE WATER—CONTINUED.

GENERAL SUMMARY OF REGULATIONS.

Initiation and Completion of Work by Company.

IDAHO—Sections 1615-1623 (Typical of all States). "In the case of incorporated companies, the proposal shall state the name of the company, the purpose of its incorporation, the names and places of residence of its officers, and the amount of its authorized, and paid-up, capital stock."

"If the applicant is not an incorporated company, the proposal shall set forth the name of the parties, and such other facts as will enable the board to determine their financial ability to carry out the proposed undertaking."

IDAHO—Sections 1621-1623—NEW MEXICO, Sections 13 and 14. "No contract shall be made which requires a greater time than five years for the construction of the work,—work shall be begun within six months from date of contract,—at least one-tenth to be completed within two years,—construction to be diligently pursued to completion (as per terms of contract)—cessation of work for a period of six months, after the second year, will forfeit to the State all rights under the contract. Upon failure to begin, or to complete, the work, within the period specified, or to conform to specifications, it shall be the duty of the State to give such parties written notice of such failure, and if, after a further period of sixty days from date of such notice (unless good reason be shown for such failure), the bond, and all work performed, shall, at once, be forfeited to the State, and the State shall, once each week, for four weeks, by publication, give notice of the forfeiture of the contract, and that, upon a day fixed, proposals will be received for the purchase of the uncompleted works, and for the completion of the contract. The money received from such sale shall first be applied against expense incurred by the State, and towards satisfying the bond, and the surplus, if any, shall be paid to the original contractor."

Contractor's bond is fixed at five per cent of the estimated cost of the works.

WYOMING—Sections 947 (amended) and 948, provide substantially the same as the Idaho statutes, except that one-tenth of the work must be completed within one year—one-third within two years, and that a cessation of work for a period of ninety days, from May 1st to December 1st, inclusive, after the second year, will operate toward forfeiture, also, that the Board may, at its discretion, accept from the contractor, a full release of all his rights under the contract, and may, thereupon, abrogate the agreement and enter into a new contract with other parties for the completion of the work.

Bond—(Section 946). Fixed at five per cent of the estimated cost of works.

COLORADO—No statutory provision; limitations of time fixed at the discretion of the Land Board and incorporated in the contract with the State. Surety bond in the amount of at least 25 per cent of the cost of construction required.

UTAH—Sections 2379-2380 (amended) and 2381. "Work to be begun within six months from date of contract—construction shall be diligently prosecuted to completion. Cessation of work for six months shall work a forfeiture of all rights and of bond (saving the rights and property which may have vested in the contractor at time of application), after sixty days' notice by the State. The Land Board shall bring legal action toward these ends, and, thereafter, shall advertise for proposals to complete the work, and, at its dis-

cretion, shall contract with a bidder, who will pay the original contractor the highest sum for the works and who will complete them at the original price. If no bid be received upon the terms specified, in the original contract, the Board shall bring action for recovery of the bond." Bond fixed at five per cent of estimated cost of works, but in no case to exceed \$50,000.

MONTANA—Section 2263. South Dakota—Section 9. "No contract to be entered into which requires more than five years to complete—all such work to be begun within one year. Upon failure to begin or to complete work within the contract period, or upon cessation of work for six months, after the second year, and after sixty days' written notice, by the State Land Board, the bond and the contract (in so far as it relates to any land not settled upon or reclaimed), shall be declared forfeited."—"The Attorney General may institute or defend any suits necessary in this procedure."—"Bonds fixed for faithful performance in such amount and with such sureties as the Board may require."

OREGON—Sections 4 and 7, Act of 1901, provide substantially the same as the Statutes of Idaho, excepting that one-tenth of the work is to be completed within the first year, and that forfeiture is provided for "failure to begin or complete same within the contract period," while the right of appeal from the decision of the Board is guaranteed the contractor." Bond is fixed by the Statute of 1909 (Sec. 7, chapter 296), at "not less than two per cent of the lien allowed." "The State may also require a cash deposit at the time of settler's application for entry, for further protection of the settler."

NEVADA—"No contract shall be entered into requiring more than three years to complete. Work to be begun within three months, and one-tenth to be completed within one year."

Cessation of work for three months (except during the period from December 1st to March 1st, inclusive), shall work a forfeiture.

The periods of time herein specified represent the maximum and minimum limits prescribed by the statutes, within which contract obligations are confined, but they do not indicate that the contracting parties may not agree upon longer or shorter periods, respectively, within such limits. In many contracts the companies are bound to institute and complete work within periods of time shorter than those prescribed by statute.

Right of Way for Company's Canals and Laterals

FEDERAL STATUTE—Under the Federal Act of March 3, 1891—Sections 18 to 21—it is provided that the right of way through the public lands and reservations be granted to any canal or ditch company, individual or associations of individuals, formed for the purpose of irrigation "to the extent of the grounds occupied by the water of the reservoir and of the canal and its laterals and 50 feet on each side thereof." "Thereafter all such lands over which rights of way shall pass shall be disposed of subject to such rights of way." The limitation of time for completion of these works is fixed at five years.

The Act of February 15, 1901, extends this right to include electrical and telephone and telegraph plants and wires.

STATE STATUTES AND REGULATIONS.

IDAHO—Section 1630; WYOMING—Section 963; COLORADO—Section 20; UTAH—Section 2387; MONTANA—Section 2274; SOUTH DAKOTA—Section 20; OREGON—Contract with company; NEW MEXICO—Section 22. "The maps of the lands selected in the office of the Board shall show the location of the canals or other irrigation works, and all lands filed upon shall be subject to the right-of-way of such canals or irrigation works, to embrace the entire width of the canals and such additional width as may be required for its proper operation and maintenance—as may be specified in the contract."

Right of Eminent Domain for Canals (and Public Enterprises).

(Provided in "Irrigation Statutes" of all States.)

The Statutes of Montana (2275) and South Dakota (21) prescribe that this right may be exercised by any person, association or corporation entering into contract with the State to condemn any property subject to condemnation as provided by the Code of Civil Procedure for Right-of-Way. The amount of land that can be appropriated is, in some cases, limited by statute.

**Company Permitted to Enlarge and Extend Its System,
or to Deliver Water for Irrigation, Power or
Municipal Purposes.**

MONTANA—(Section 2264.) **SOUTH DAKOTA** (Section 10). "The builder of any such canal, or other irrigation works, shall have the right to construct, or subsequently to enlarge, or to make such changes in the same, as will permit the water to be used for power purposes, and to use any surplus water carried therein for such purpose (without interference with the rights of any purchaser of a water-right)—all income from such power use shall belong to the builder, but "such use shall be subordinate to irrigation and domestic use of water," etc. The contract between the State and the company, previously referred to, permits additional appropriations of water, and increase of capacity of system or any part thereof, for the irrigation of further lands, upon approval by the State Engineer, and provides that "so much water as may be necessary for the use of cities and towns which are necessarily dependent upon the system, shall be furnished upon such terms as may be agreed upon between the company and the municipality—upon contributing to the support of the system in proportion to the amount of water used, and shares of stock in the (operating) company may be issued for the amount of water represented by such use, to the trustees of any village or the mayor, in trust, for the benefit of the inhabitants," etc. The contract between the "State of WYOMING and company," cited, provides that the company "may reserve from final disposal the right to the use of the water for power purpose, if such right be utilized within ten years from date of contract," and provides that, "in case all the water appropriated cannot be used for irrigation of all the land described, then the surplus may, with the consent of the State Engineer, be sold for municipal and other beneficial purposes—this right to be evidenced by shares in the (operating) company."

One contract between a UTAH company and the settler provides for a "reservation to the company of power rights."

OREGON—Contract between State and Company—"Company may sell water rights to lands outside of Carey Act Segregation upon approval of the State Land Board, upon same terms and conditions as provided for 'Carey Act' lands, and upon the cancellation of an equal area of such lands."

**When Company May Sell Water Rights or May Contract
for the Sale of Such.**

See "Lands Thrown Open to Public Entry" and "Protection of Settler's First Payment."

**Water Rights—Shares—Control and Operation of Works
—Final Transfer of Ownership.**

IDAHO—Stock in "operating company" (named),—one share to each acre "entered,"—evidenced by "Certificate of Ownership"—is issued at time of purchase, to be held by constructing company as collateral security for completion of payments; company votes settler's shares until 35 per cent of purchase price has been paid.

WYOMING—When "operating company" is organized at the time the "construction company" enters into contract with the State, the property is immediately turned over to it by deed which is held in escrow by the Commissioner of Public Lands until the settlers have paid the main proportion of the purchase price.

As rapidly as the fixed per cent (50%) has been paid, the shares of stock in the operating company are issued to settlers, and they immediately assume the powers granted them and vote upon all questions,—until this time the "company" holds the stock and votes it, or, the company, at its option, may turn over the irrigation works when 90 per cent of the contracts are sold. The settlers must organize an "operating company" to which the physical works can be deeded. New certificates are issued to settlers upon surrender of their original certificates from "the constructing company." Other procedure same as in the case of Idaho.

COLORADO—In one contract shares in the constructing company, itself, are issued when 75 per cent of the water rights are sold, and upon full payment, upon the part of the settler, of the purchase price.

In another contract, the company agrees that, upon pay-

ment of the entire purchase price, it will cause an "irrigation company which may be organized" to issue a deed to the water rights, and that, when 90 per cent of the contracts are sold, it will issue stock in the "irrigation company,"—the "construction company" retaining control of the system until all the stock shall have been issued. In both cases one share of stock is issued against each 40 acres, the settler's interest, prior to the issuing of shares, being confined to the right to the use of the water, as stipulated. The "company," further, provides that in case the water be not ready for delivery within three years from date named in the contract, the trust company holding the advance payments in escrow, may be required to refund all such payments, together with interest.

UTAH—Right to the use of the amount of water contracted for passes with the first payment. Upon full payment by settler, and at the discretion of the Board, shares in an "operating company," to which all the "company's" interests are to be transferred by warranty deed, will issue to settlers—one share to the acre,—or, at its option, the company will issue a warranty deed to the settler, directly.

MONTANA—Contract with Company. Shares in "operating company"—one share to each acre—pass with first payment—to be held as collateral security, and the voting power of which is reserved by the "company" "until 35 per cent of purchase price is paid."

The Statutes (Section 2265), (also **SOUTH DAKOTA**, Section 11), provide that "the company may maintain and operate the irrigation works until water rights appurtenant to 90 per cent of the lands have been paid for, when such works shall be turned over to the settlers, who shall, thereafter, have the right to maintain and operate it," and the "contract" provides for such transfer of all its interests excepting only the right to sell water rights at that time unsold, and "units" of the segregation are turned over to the "operating" company for control upon proper certification of completion, upon the part of the Land Board.

OREGON—One "water right" (right to the use of water) to each irrigable acre, passes at time of purchase. Company is to organize a "water users' corporation" at time specified in contract with State (in one case 10 years from date of entering into contract with State), at which time shares in such corporation will be issued to all settlers who may have completed the payments due,—the company retaining the right to sell all shares or "rights" then unsold.

The contract specifies, further, that until settlers shall vote the majority of the stock, the company shall elect to the Board of Directors, such proportionate number of settlers as their paid-up shares shall entitle them to, and that the books of the "operating company" shall then be open to the inspection of the settlers themselves. (See also "Lands Thrown Open to Public Entry.")

NEW MEXICO—Settler at time of contract subscribes for shares of stock—one to each acre—in an "irrigation company," certificates of which will be delivered to him when all payments are completed, and which are to be held by the company, with all voting power, until the date of such issue. "Company" conveys its interests to "irrigation company" by deed when the last-named company is organized.

IN GENERAL—It is to be understood that where the entire interest is at once transferred to an "operating company" or an "irrigation company," this organization assumes, at once, complete control and administration of the works, with the obligation to keep it in repair and with the right to levy such toll or maintenance fee as in the contract with the "constructing company" provided. As long as the "constructing company" retains control of the "operating company," through its majority voting power, it is under contract obligation to cause the subsidiary company to maintain the works. Where contracts provide for the transfer of the interests, at a later date, then the "constructing company," itself, administers the works, directly.

[Mr. Bohm's next article will continue the discussion of Water Rights, Cost, Maintenance, Fees, etc.]

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cloth bound copy of the Primer of Irrigation**

Recent Legal Decisions on Irrigation and Related Rights

PROVISION FOR APPEAL IN CALIFORNIA IRRIGATION LAW IS UNCONSTITUTIONAL.

In the case of Chinn and others vs. the Superior Court of San Joaquin County, 105 Pacific Reporter, 580, growing out of the board of supervisors of the county granting the application made for the formation of an irrigation district in said county to be known as "the South San Joaquin Irrigation District," in which certain parties objected to having their lands included, appealing from the action of the board to the superior court, the supreme court of California holds that the superior court was correct in its view that the portion of the irrigation act attempting to authorize an appeal to the superior court from the order of the board of supervisors was unconstitutional and void. The explanation of this is that under the state constitution the legislature can provide for an appeal to the superior court from a court only, such as a justice or other inferior court, and not from any other tribunal.

POWER OF COURT TO COMPEL BOARD TO ACT IN RECLAMATION MATTER.

The supreme court of California says, in Inglin and others vs. Hoppin and others, 105 Pacific Reporter, 582, that this was an application for a writ of mandate or mandamus directing the board of supervisors of Yolo county to set aside a specific order theretofore given by them in the matter of the petition of the plaintiffs to have certain lands situated in reclamation district No. 730 of said Yolo county set off and erected into an independent district, by which order the petition was denied, and to enter an order granting the petition. A demurrer to this application was filed, presenting the question whether, accepting as true the facts stated in the application, any ground was shown for the issuance of the writ asked.

While, of course, it is the general rule that mandamus will not lie to control the discretion of a court or officer, meaning by that that it will not lie to force the exercise of discretion in a particular manner, still cases cited here in the court's opinion abundantly show, it says, that mandamus will lie to correct abuses of discretion, and will lie to force a particular action by the inferior tribunal or officer, when the law clearly establishes the petitioner's right to such action. Such was the case presented here by the pleadings.

Where a question of fact is doubtful or disputed, the court will not interfere with the determination of the supervisors; but if it be established before the superior court, as alleged in the petition, that the evidence before the supervisors was uncontradicted, competent, and sufficient to prove satisfactorily all matters required by the political code, it will become the clear duty of the superior court to issue its mandate to the board of supervisors to accord to the petitioners the right which the statute clearly gives. The hearing will be had upon the same evidence presented to the board of supervisors.

RIGHTS OF APPROPRIATOR FOR IRRIGATING PURPOSES AS AGAINST MILL OWNER POLLUTING STREAM—RIGHTS OF JUNIOR APPROPRIATOR OF OVER-APPROPRIATED STREAM.

The supreme court of Colorado says that the case of Humphreys Tunnel & Mining Co. vs. Frank, 105 Pacific Reporter, 1093, which was really begun by the said Frank, was shown to be like this: A mill owner who had acquired the right to the use of waters artificially developed in the working of mines used it for milling purposes in concentrating ores, and after it had become impregnated with poisonous and noxious substances discharged it, in the form of tailings and slimes, into the channel of a natural stream, to the injury of a landowner who had made an appropriation of the waters of the stream for irrigating purposes long before the rights, if any, of the millowner attached.

The millowner (company) set up a number of defenses, but, in brushing these all aside, and affirming a judgment in favor of the landowner (Frank), the supreme court declares, upon general principles of law, it was entirely clear that the millowner was liable in damages for this pollution of the stream which injured the landowner.

It having been found on uncontradicted evidence, even from the admission of the millowner's president, that it was entirely practical and feasible for it, with a comparatively small expenditure and within a few weeks' time, to take care of the tailings and waste material upon its own premises, it should do so, and not cause needless injury to another important industry.

The fact that the millowner in operating its mill used waters which were not a part of the natural flow of the stream did not give it the absolute right to discharge into that stream the waste water mixed with hurtful slimes, or absolve it from liability for resulting injuries to third persons who had lawfully acquired prior rights to use the waters thereof for any beneficial purpose.

It was contended that the millowner, in operating its mill, was but the agent of the mineowners whose ores it treated under contract, wherefore they, and not it, should have been sued, but it could not escape liability, if its own act contributed to the landowner's injury, even if others had participated in the wrong.

Another objection to the landowner's recovery of a judgment was that the natural waters of the stream were appropriated up to its full capacity, during the ordinary flow, by other appropriators whose rights attached before his appropriation was made, and as the prior appropriations exhausted the entire ordinary flow, there was no water left in the stream with which he could irrigate his lands; therefore he could not have sustained any damage as the result of the millowner's acts, because he had no right that was thereby infringed. This was a fallacious contention. The landowner acquired valid rights as the result of his direct appropriation from the stream, and to the overflow of the stream for his meadow lands, and these rights were vested before the millowner began the construction or operation of its mill. His rights were, of course, paramount to any rights the millowner had in the waters of the stream. His rights were subject only to the rights acquired by prior appropriators of the water for some useful purpose, and his right, as well as theirs, as against the millowner, was to have the natural waters and all accretions come down the natural channel undiminished in quality as well as in quantity.

Though other appropriations, to the full capacity of the stream during its ordinary flow, were made before this landowner's rights accrued, this did not prevent him from building a ditch and diverting and using its waters whenever his seniors did not need it. Floods often occur, and the natural flow of the stream is thus augmented. No appropriator uses water all the time. It is well known that many streams of this state are overappropriated; yet appropriators whose rights accrue after the ordinary flow is fully appropriated have, nevertheless, acquired valuable rights, and often enjoy the use of water for their lands, which rights the law protects against trespasses of others. When the demands of the senior upon the stream cease the right of the junior attach, and, as against a wrongdoer like the millowner, the junior is entitled to protect the stream from pollution, the same as if he were the senior appropriator. If the acts of the millowner interfered with such rights of this junior landowner, as they did, it must be held responsible for the resulting injury.

LAND NOT NECESSARILY NONIRRIGABLE—CONCLUSIVENESS OF DETERMINATION OF COUNTY BOARD—PROCEDURE FOR DETACHING LAND FROM DISTRICT.

The supreme court of Nebraska says that the case of Sowerwine and others vs. Central Irrigation District, 124 Northwestern Reporter, 118, was brought for the purpose of having certain lands detached from the irrigation district. It was alleged that the lands in question were low, wet, swamp, and totally unfit for irrigation. But the court does not think that a finding that during three months of the year a slough running through the land was practically full of water, and a part of the land involved was more or less wet and spongy, and at different places had standing water holes of greater or less dimensions, while during the low-water period extending through the other nine months of the year the slough was practically dry and the land involved was dry, could be held to be equivalent to a finding that the lands were "totally unfit for irrigation."

Such a finding as first stated clearly showed that the case came within that class which is for the determination of the county board. The court could not say, as a matter of law, that the land was nonirrigable.

In order to defeat the jurisdiction of the county board, it must be clearly shown, and in like manner found by the court, that the lands embraced within the district are in fact nonirrigable. If, under the facts as found by the court, there is any doubt on that subject, such doubt must be resolved in favor of the jurisdiction of the board, and the parties left to the remedy provided by statute. This being, therefore, a case for the consideration of the board, then its order establishing and defining the boundaries of the district was conclusive, at least in this collateral proceeding, on the question whether the lands included would be benefited by irrigation.

After an irrigation district has been duly organized, the statutory procedure prescribed for detaching lands, other than those which cannot from some natural cause be irrigated, is exclusive.

Where the owner of land proceeds in a suit in equity to have the same detached from an irrigation district, in order to defeat the jurisdiction of the county board it must be clearly shown, and in like manner found by the court, as before stated, that the land embraced within the district is in fact such that, from some natural cause, it is nonirrigable, or is expressly exempted by statute from the operation of the law providing for the organization of irrigation districts, and the taxing of lands within the boundary of such district for irrigation purposes.

FLIGHT OF PURCHASER UNDER WARRANTY DEED OF "BOUGHT WATER" WHICH COMPANY REFUSES TO FURNISH.

A man named Starbird gave a deed with full covenants of warranty to a Mrs. Jacobs for 20 acres of land, with one share of stock in an extension ditch and reservoir company, and also 7½ inches of "bought water" from said ditch. The term "bought water," as was agreed, was a right in Starbird to have, during each irrigating season, from the ditch company, upon the payment of a fixed annual stipend therefor, the use of 7½ inches of water for the partial irrigation of the land sold.

Subsequently, when demand was made on the company for delivery of the "bought water" for the season, and a tender of the agreed annual rental therefor, the company declined to deliver the same on the ground that Starbird had no such right as he claimed, or any right to have and receive this water. Thereupon Mrs. Jacobs brought an action against

(Continued on page 275.)

Notes on Practical Irrigation

D. H. Anderson

RELATIONS OF WATER TO THE SOIL.

When a small portion of soil is thoroughly dried and then spread out on a sheet of paper in the open air it will gradually drink in watery vapor from the atmosphere and thus increase its weight to a perceptible degree. In hot climates and during dry seasons this property of absorption in the soil is of great importance restoring, as it does, to the thirsty ground, and bringing within reach of plants, a part of the moisture they have so copiously exhaled during the day. Different soils possess this property in unequal degrees. During a night of twelve hours, for it is at night that watery vapor is deposited on the ground (evaporation from the soil occurring during the day), 1,000 pounds of perfectly dry soil will absorb the following quantities of moisture in pounds.

Quartz sand	0
Calcareous sand	2
Loamy soil	21
Clay loams	25
Pure clay	27

Peaty soils and those rich in vegetable matters will absorb a much larger quantity from the atmosphere, sometimes becoming "wet" two inches deep, a surprising quantity of water when the weight of it on an acre of ground is calculated. The weight of dry and wet soils has already been given, and the difference between the two will, of course, show the quantity in weight of the moisture or water absorbed. The average weight of dry soils is about 94 pounds, the average ordinary wet weight is 126 pounds, the difference, being 32 pounds, represents the average weight of water per cubic foot. Now, multiplying 43,560 square feet in the acre by 32, gives 1,393,920 pounds to the acre one foot deep, and dividing by 12 to ascertain the weight of one inch, we have 116,160 pounds, or about 58 tons of water falling on an acre of ground in the shape of dew in a single night. Of course that quantity represents the highest possible absorptive quality in a heavily charged vegetable soil. Other soils would receive a less quantity as will be readily understood, but there is enough to be equivalent to quite a smart shower and worth encouraging.

In what are known as "dry" climates there is always some moisture in the atmosphere which is deposited upon the soil, for wherever there are oxygen and hydrogen there must be moisture. But the quantities vary in climates as much as they do in soils. Where there is evaporation from the soil moisture during the day there is also a re-absorption of moisture the soil at night and, with this fact in mind, it may be laid down as an axiom: The tendency of water is to evaporate from the soil into the atmosphere during the day and to fall back upon the soil during the night. To reduce the idea to an axiom: A dry soil has an affinity for a moist atmosphere, and a dry atmosphere loves a moist soil.

Saturation and Power to Retain Moisture.

The rain falls and is drunk in by the thirsty soil; the dew descends and is absorbed, and the waters of irrigation poured upon the ground quickly disappear. But after much water falls upon the earth the latter becomes saturated, can hold no more, and the surplus runs off the surface or sinks down through until it reaches the water table. This happens more speedily in some soils than in others. Thus, 100 pounds of dry soils, as here specified, will hold the quantity of water set opposite their respective names without dripping or pruning off.

Quartz sand	25 pounds
Calcareous sand	29 pounds
Loamy soil	40 pounds
Clay loam	50 pounds
Pure clay	70 pounds

But dry, peaty soils and adobe will absorb a much larger proportion before becoming saturated to the dripping point; sometimes such soils will absorb their own weight of water. Arable soils generally will hold from forty to seventy per cent of their weight of water.

This power of retaining water renders such a soil valuable in dry climates. But the more water the soil contains in its pores the greater the evaporation and the colder it is likely to be. Indeed, evaporation is a source of cold, sometimes to so great a degree that ice will be formed. In very hot regions in India where ice is inaccessible it is customary to place small, shallow saucers filled with water on the ground after night-fall, and they are gathered in the morning before sunrise, the water being converted into ice by the rapid evaporation from the soil during the night. Our modern ice machines owe their efficacy for making ice to the rapid evaporation of ammonia under pressure. Ether, chloroform, alcohol, and numerous other substances, produce a sensation of cold when rubbed on the skin, which is not due to anything in those substances, but wholly to their rapid evaporation or volatility. The presence of a saturation of water in the soil, however, excludes the air in a great degree and thus is injurious to plants, whose roots must have air as well as moisture, hence the necessity for drainage where there is a liability to saturation.

Earth Vapor Constantly Rising.

Unless rain or dew is falling or the air is saturated with moisture, watery vapor is constantly arising from the surface of the earth. The fields, after the heaviest rains and floods, gradually become dry, and this takes place more rapidly in some fields or parts of fields than in others, in fact, wet and dry patches of ground may be seen on the same field, indicating a heavy or light soil. Generally speaking, those soils capable of containing the largest portion of the rain that falls also retain it with greater obstinacy and require a longer time to dry. The same thing happens when the land is irrigated. Thus, sand will become as dry in one hour as pure clay in three, or peat in four hours.

There is one fact every irrigator should constantly bear in mind and that is: Water saturation of the soil is never necessary to plant life; it is, in fact, positively injurious except in the case of aquatic plants. A long time ago men, seeing rice growing luxuriantly in swamps, imagined that plant would not grow anywhere else, and, accordingly, rice culture meant a swamp. But it was discovered that rice would grow better and produce a larger and richer crop in arable soil generally, and now it is cultivated with astonishing success the same as wheat, barley, or any other cereal, except for a short period of flooding.

Nature, through heavy rains and other water sources, converts the soil into a storage reservoir by establishing a water table beneath the surface from which the water vaporizing up constantly moistens the growing stratum of the soil, decomposes and dissolves the salts which are necessary to plant life, and is itself decomposed by the principle of life in the plant and its elements, oxygen, hydrogen, and nitrogen, utilized in the interior of the plant itself. Where there is no natural supply of water for this storage purpose irrigation must copy nature and provide one, or at least furnish an adequate supply of moisture for solvent purposes. When that has been done everything has been done that should be done.

A familiar illustration of the action of moisture may be witnessed in the slaking of lime in the open air without the direct application of water. The same transformation takes place in the case of all the other soluble mineral salts when in the presence of moisture. This transformation effected, the plant thrives, and, to give it an excess of dissolving liquid is to float off the material needed by the plant and thus deprive it of its nourishment. It is like feeding an infant on thin, weak soup instead of nourishing bouillon and expecting it to thrive.

Evaporation From Plants.

The tendency of plants is to exhale or perspire moisture as well as the soil. The flow of the sap is constant from the roots to the leaves to receive oxygen and carbonic acid and back again to the roots; like the circulation of the blood in animals it travels in a circuit. When the sap reaches the leaves it parts with a portion of its water, and in some plants the quantity is very considerable. An experiment with a sunflower, three and one-half feet high, disclosed the fact that its leaves lost during twelve hours of one day, 30, and of another, 20 ounces of water, while during a warm night, without dew, it lost only three ounces, and, on a dewy night, lost none.

All this evaporation or exhalation of water from the leaves of plants is supplied by the moisture in the soil, for plants generally do not drink in water through their leaves but through their roots, and when the escape of water from the leaves is more rapid than the supply from the roots

the leaves droop, dry and wither, because then they are drawing from their sap, living, so to speak, upon their own blood. This evaporation in the plant is similar to the perspiration constantly exuding from the skins of healthy animals and it has added to it the mechanical evaporation which takes place on the surface of all moist bodies when exposed to hot or dry air. There can be no growth or health without it, hence, it is often beneficial to wash or spray the leaves of plants and trees to remove the dust or other clogging material that has accumulated upon the leaves and "stopped perspiration." To stop this leaf evaporation is to kill the plant as surely as was killed the boy in the Roman pageant. His entire body was covered with a thick coating of gum arabic, on which was laid a layer of gold leaf, the intention being to have him pose as a golden statue. He died in a few hours and it was not until the cause of his sudden death was investigated by scientific men that it was discovered that the closing of the pores of the skin, thereby preventing evaporation from its surface, was the cause. On dry, dusty soils, where there is none, or very little rainfall, the accumulation of dew during the night is generally sufficient to "trickle" along the leaves and carry down the dust and other accumulations on the leaves which interfere with evaporation. Sometimes the plant, as if aware that there is a stoppage in its circulation, will throw out fresh, new leaves to cure the defect, but this is done at the expense of the root, tuber, or fruit.

The amount of loss due to natural and mechanical evaporation from plants, of course, differs very greatly in the various species of plants depending, in a great measure, on the special structure of the leaf, whether fine or coarse meshed, large or small, lean or fleshy, the natural perspiration, however, always exceeding the mechanical. Both processes, moreover, are more rapid under the influence of a warm, dry atmosphere aided by the direct rays of the sun.

As showing the quantity of evaporation an experiment was tried with an acre of maple trees containing 640 trees. The calculation is not positively exact, but it is worth accepting as a basis for other experiments on crops of all kinds and may come somewhere near enabling the irrigator to determine the quantity of water to be applied to the soil, whether there is a water table within the reach of the surface or none at all.

The evaporation was assumed to take place only during a day of twelve hours and each of the 640 trees was estimated as carrying 21,192 leaves. From an estimate based on the quantity of evaporation from one tree containing the number of leaves above specified, which were carefully counted, the 640 trees evaporated from their leaves in twelve hours 3,875 gallons of water, or 31,000 pounds. During ninety-two twelve-hour days, the life of the maple leaf, the evaporation would amount to 2,852,000 pounds. During that period the rainfall was 8,333 inches or 43.8 pounds to every square foot of surface, equal, per acre of 43,560 square feet, to 1,890,504 pounds. The evaporation from the leaves of the trees, therefore, exceeded that of the actual fall of rain by nearly one million pounds. Whence did the surplus come? Evidently from the water stored in the water table and drawn up by the action of the roots of the trees. Where there is no water table or ground water and the soil is dry "all the way down," it is necessary to create one by irrigation and this is not so difficult as might be imagined, for we must consider that in the case of maple trees the roots may reach down into the subsoil for fifty feet, and in the case of ordinary fruits, vegetables, and cereals, a water table at that depth would be wholly unnecessary even if generally impracticable. Soil saturation at any depth beyond four feet with unlimited surface cultivation is sufficient, although in the case of vines and trees it should be much deeper.

The above experiment with the maple trees although, perhaps, of no practical value on account of its uncertainty, being more or less guess, demonstrates two things, when there is also taken into consideration the quantity of sap in plants and the amount of salts held in solution in it.

First—How easily a soil may be exhausted by cutting and removing plants and crops therefrom.

Second—As a direct corollary, through its diametric opposite, it shows how easily alkaline salts may be removed from the soil by cutting and removing the plants and crops. These alkali-consuming plants hold large quantities of the earth salts in their sap in solution, the carbonates, sulphates, the sodas, and potash, literally taken up out of the soil. Of course, when removed a certain amount of alkali is removed with them. This has been the experience with the "salt meadows" in Germany and Holland, and in the United States, as has

been already noted, and, in a small way, with the alkali lands of the West where the experiment has been made.

When water is poured into the saucer or sole of a flower-pot filled with earth the soil gradually sucks it up and becomes moist even to the surface. This is what is known as "capillary action," and exists in all porous bodies to a greater or less extent. A sponge is a well known instance of this power, and if the small end of a piece of hard chalk is held in water the entire mass soon becomes saturated. The experiment with the flower-pot, however, represents the action in the soil, the water from beneath—that contained in the subsoil—is gradually sucked up to the surface. It is one of the operations of the laws of nature which maintains all things in constant motion to preserve their life and vitality, for, if permitted to remain at rest without motion, they sicken and die, afterward putrefying as happens even with water which becomes stagnant, that is, ceases to be in motion.

In climates where there is winter, or even a moderate degree of cold weather, this capillary action ceases and the tendency of the water is to "soak" downward, and it is not until warm weather that capillary action begins and the water commences "soaking" upward toward the surface. In a warm, or hot climate, this action is constant and it also takes place whenever the soil is parched or dry.

This suspension of capillary action in winter, or cold weather, furnishes a strong point in favor of winter irrigation, which really takes the place of the autumn and spring rains, and of the snow that slowly melts and its waters carried down into the soil to the water table ready to begin an upward movement when the weather becomes warm and the surface soil dry.

The dryer the soil and the hotter the atmosphere, the more rapid is the rising of the water to the surface by capillary attraction, and, as the water ascends, it carries along with it the saline matters dissolved by it and, reaching the surface, evaporates, leaving the salts it carried behind. It is this capillary action which has incrustated our own lands with alkalis of all kinds; it is the same in India, Egypt, South Africa, and elsewhere. On the arid plains of Peru, and on extensive tracts in South Africa, alkali deposits, several feet in thickness, are sometimes met with, all of which are caused by the capillary action of water bringing up to the surface the salts in the subsoil. So it is that the enormous beds of nitrate of soda in Peru and those of the carbonate of soda in Colombia were created; and in our own black and white alkali and sodium bad lands capillary action may be blamed for their condition. It must not be forgotten that wherever there is seepage there is also capillary action, for that power is exercised in every direction. It does not matter which end of the sponge or piece of chalk is held to the water, both become saturated. It may be said that capillary action is a violation of the law of gravity, or, rather, is a law of itself acting independently.

This tendency of water to ascend to the surface of the earth is not the same in all soils. It is less rapid in stiff clays and more rapid in sandy and open, porous soils generally, and it is of especial importance in relation to the position of the water table in the soil when considered as a source of water supply or shallow rooting plants. Gravity draws the water downward toward a water table, and in a dry subsoil it is capillary attraction that impels it down. But when the water in the surface soil is less than that below an upward movement begins as though nature were desirous of maintaining an equilibrium which, scientifically speaking, it always does, or attempts to do. However, there is a zone of capillary action, a space between the water table and the surface, in which moisture rises and with it carries food substances to the roots of plants. Where the water itself rises it means more than capillary attraction, it means a rise of the water table through additions from some new water supply or saturation of the soil, in which case plants are injured vitally and drainage must come to the rescue. It is the rise of the water table that is to be feared in irrigation. The reason is because the rise of alkaline solutions is greater than in the case of pure water. Thus, a 50 per cent solution of sodium chloride (common salt) and sodium sulphate will rise faster than pure water, and a much stronger concentration of soda carbonate will rise still faster. Hence the necessity of preventing soil saturation and the maintaining of a zone of capillary action, in which the roots of plants may be fed by material furnished through that action when they would be killed if saturation were permitted to overcome it.

A few practical ideas may be gathered from the foregoing which are worth considering:

First—It is evident that deep plowing will enable the rainfall or the irrigation water to penetrate deeper into the soil, in which case it will remain longer and the effects of a small quantity of rain may extend over a period long enough to mature a crop where half as much again would show nothing.

Second—To be effective and beneficial to vegetation the water in the subsoil must be in constant motion. When water ceases to flow in the subsoil streams, or when capillary action is entirely suspended, the water becomes stagnant, ceases to imbibe oxygen, nitrogen and carbonic acid, and practically rots, causing vegetation within its influence also to decay. Running water coming from the clouds or irrigating ditch enters the soil charged with gaseous matters above specified, mixed in their proper proportions, and carries along with it various dissolved inorganic substances which are not permitted to be deposited out of it while it is in motion. Hence, to derive the full benefit of the water, the land must be drained even where irrigation is practiced, so that the surplus water, after irrigation is stopped, may find a ready outlet. If there should be no surplus, no harm is done by drainage facilities; on the contrary, the tendency of all drainage is to open the soil below and "draw" the moisture from above as well as to carry off the surplus water in a soaked subsoil if there be one. Drainage does not carry off moisture, but only the surplus water; capillary attraction will always hold the moisture.

Third—Whenever sufficient water is added to the soil to compensate for loss by evaporation from soil and plant, the business of the irrigator is accomplished. To keep on adding, to soak the soil continually, would be to injure vegetation as much as by furnishing too little water, as it is only by keeping the surface soil loose and finely pulverized—the deeper the better—that evaporation from the soil may be retarded.

As to the quality of the water the more impure it is, particularly in organic matter, the better it is for vegetation. There is no more impure water in the world than that of the river Nile, yet it gives fertility and produces luxuriant vegetation where there would be barrenness and sterility were it pure. The exception in the case of irrigating alkali lands would be water heavily charged with alkali salts, this kind of water being one of the causes of deleterious alkali deposits.

The oxygen of the atmosphere is essential to the germination of the seed and to the growth of the plant. The whole plant must have air, the roots as well as the leaves, therefore it is of consequence that this oxygen should have access to every part of the soil and thus to all the roots. This can only be effected by working the land and rendering it sufficiently porous.

Some soils absorb oxygen faster and in greater quantities than others. Clays absorb more than sandy soils, and vegetable molds or peats more than clay. It depends, however, upon their condition as to porosity, and also upon their chemical constitution. If the clay contains iron or manganese in the state of oxides these latter will naturally absorb oxygen in large quantities for the purpose of combining with it, having a great affinity therefor, while a soil containing much decaying vegetable matter will also drink in large quantities of oxygen to aid the natural decomposition constantly going on.

In addition to absorbing oxygen and nitrogen, of which the air principally consists, the soil also absorbs carbonic acid and portions of other vapors floating in it whether ammonia or nitric acid. This absorption of atmospheric elements and gases of every kind occurs most easily and in greater abundance when the soil is in a moist state. Hence it is that the fall of rains and the descent of dew, or the application of irrigation water, favors this absorption in dry seasons and in dry climates; it will also be greatest in those soils which have the power of most readily extracting watery vapor from the air during the absence of the sun. It must be clear from this that the influence of dews and gentle showers reaches much farther than the surface of the soil, watery vapor following the atmosphere down deep into the soil, penetrating as deep as the porous nature of the soil will permit it. Some say that, under proper conditions as to cultivation, the soil will gain in dew at night nearly as much as it loses by evaporation during the day. It appears reasonable enough to suppose that the atmosphere, under a pressure of fifteen pounds to the square inch, will penetrate to any depth and carry with it whatever of moisture and gases it contains.

Irrigation of Alfalfa

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The Check Method.

The essential features of the check method of irrigation consist in surrounding nearly level plats of ground

with low levees, and in making provision to flood each by means of a ditch and check box or gate. The inclosed spaces may be laid out in straight lines in both directions, thus forming with their levee borders a series of rectangles, or the levees may follow more or less closely the contour lines of the natural surface of the ground, thus forming contour checks. The most favorable conditions are a light, sandy soil on a comparatively even slope of 3 to 15 feet to the mile, abundantly supplied with water. This method is also used on heavy soils, where it is necessary to hold the water on the soil to secure its percolation to the desired depth.

In California not only does the form of the

checks vary, but their size as well, some of the smaller being less than one-half acres in area, while some of the larger contain more than 10 acres.

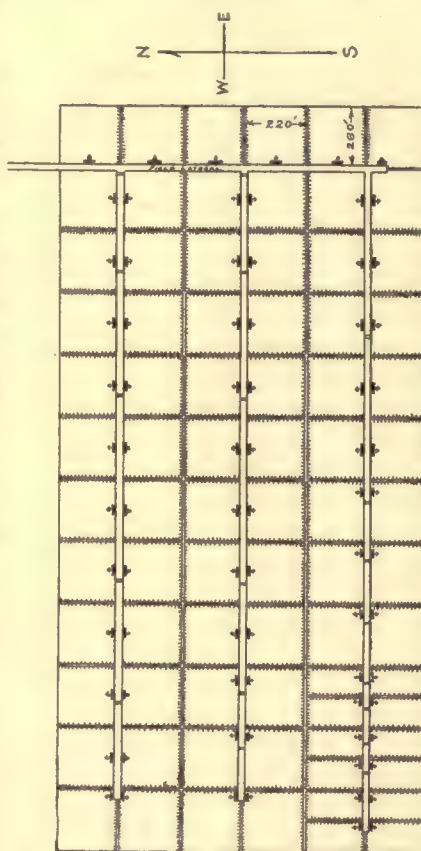


Fig. 6.—Laying Out Rectangular Checks on Farm of T. K. Beard, Modesto, Cal.

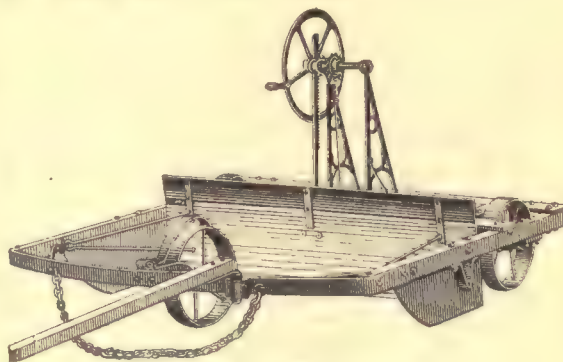


Fig. 7.—Grader.

In the Modesto and Turlock irrigation districts the surface of the land under ditch slopes about 5 feet to the mile, and is too uneven to be irrigated without being leveled first. The unevenness consists in swales, hog wallows, and mounds. The land is surveyed first either by an engineer or by the owner. In the latter case use is made of a carpenter's level, with peep sights, mounted on a tripod (fig. 5). The long side of each check should

be on the flat slope and the short side on the steep slope. A fall of 3 to 5 inches between adjacent checks is preferable to either more or less. Usually the width of checks can be so adjusted as to permit of this difference in elevation. The length of each rectangle will depend on the slope in that direction as well as the location of the supply ditches. The field should be laid out in such a way that the levees may be built with the least handling of dirt. Rectangular checks possess many advantages over irregular contour checks, but if much of the better quality of surface soil has to be removed in order to build the former, the advantages may be more than outweighed by the damage caused by grading and the extra cost.

Figure 6 shows in outline the rectangular checks, supply ditches, and check boxes on the farm of T. K. Beard, east of Modesto, Cal. Mr. Beard plows the land in the early spring to a depth of 6 inches with a 4-gang plow. During the summer the checks and ditches are built in a sort of rough way, no effort being made to level the floor of the checks or to smooth the levees and ditch banks. It is then heavily irrigated, and after the soil is sufficiently dry the floor of each check is carefully leveled and the levees trimmed and smoothed. For the latter purpose the grader shown in figure 7 is preferred. One passage of this grader across the top of each levee and once along each side reduces the levee to a base of 14 feet, and a height of 8 inches on the high side.

On the west side of the San Joaquin Valley the land to be seeded to alfalfa is almost invariably formed into contour checks. A common arrangement is that shown in figure 8. Here the supply ditches are intended to be about 600 feet apart, and levees are built midway between. The sides of the checks conform in a measure, but not exactly, to the natural contours, having a difference in elevation of 0.3 to 0.4 foot. The average area of a check is half an acre. In 1908 prices were obtained on the cost of preparing land in contour checks and seeding to alfalfa. The average cost on 2,067 acres of comparatively smooth grain land was \$11.46 per acre. Across the river in Modesto and Turlock districts, where rectangular checking is more common and where the natural surface is more uneven, the cost was estimated at \$17.50 for contour checks and \$19 for rectangular checks. These latter figures included ditching, but excluded the cost of seed and seeding.

feet per second are available four checks may be irrigated simultaneously. This head flowing on a check containing 1 acre would cover it to a depth of about 5 inches in one hour. A part of the water so applied is always lost by evaporation, but the balance percolates into the soil to furnish moisture to the plants. The skillful irrigator begins with the highest checks and works down for the reason that all waters which escape through the gopher holes or broken levees may be then applied to dry checks. To reverse this rule might result in overirrigating the lower checks. The average cost of irrigating for the season where proper check boxes are inserted is about

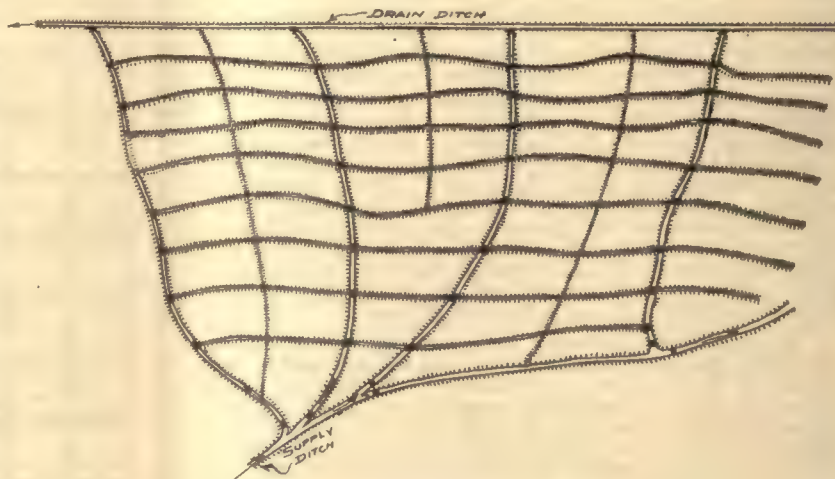


Fig. 6.—Laying Out Contour Checks.

60 cents an acre.

On the west side of the San Joaquin River each of the irregular compartments contains 1 to 3 acres, averaging about 2 acres. Few permanent wooden check boxes are used. The water is checked up by dams of coarse manure, and an opening is made in the levee bank with a shovel to admit the water. The lack of suitable boxes to control the water passing from the feed ditch into each check and the use of smaller heads greatly increase the cost of irrigating over that of the Modesto and Turlock districts. In the latter the cost for the season was estimated at 60 cents per acre, while in the former the estimate is 90 cents for each watering.

The chief advantage of the check method is that one man can attend to a large volume of water and can irrigate 7 to 15 acres in ten hours, making the cost of applying water less than by any other method except the border method. To counterbalance this important gain, there are several disadvantages which western farmers ought to consider. These are the removal of a considerable quantity of surface soil to form the levees, which frequently decreases the yield on the graded spots; the extra cost of preparing the land; the damage done to farm implements in crossing levees; and the fact that this method is not well adapted to a rotation of crops.

The Flooding Method.

Flooding from field ditches or laterals is still the most common method of applying water to the arid lands of western America. In the States of Colorado, Montana, Wyoming, Utah, and to a large extent in Idaho, alfalfa, clover, native meadows, and grain are irrigated in this way. This manner of wetting dry soil originated, it is believed, in the mountain States, and the past half century has witnessed a gradual evolution of this plan, so that now it has not only become firmly established, but is regarded as the best suited to the conditions under which it is practiced. It can be profitably used on slopes

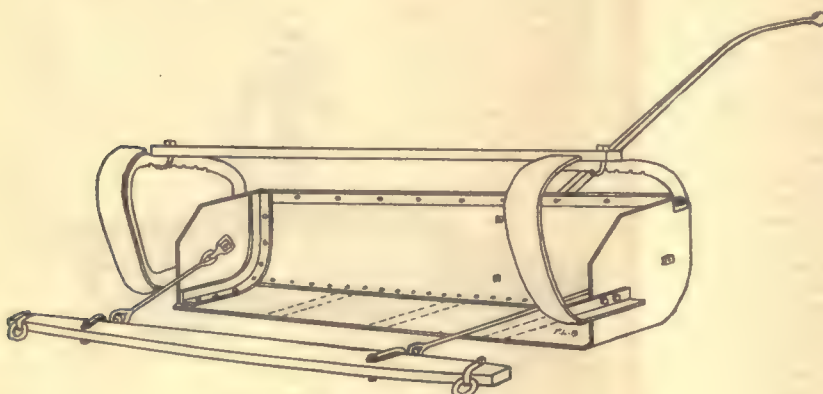


Fig. 9.—Scraper.

In the Modesto and Turlock irrigation districts the feed ditches are designed to carry large heads of 10 to 20 cubic feet per second. These large heads are used by the farmers in turn for short periods of time, depending upon the acreage served. In the smaller checks a head of 5 cubic feet per second will suffice, and if 20 cubic

that are too steep for other methods. Fields having a firm soil and a fall of 25 feet to 100 feet have been flooded successfully. From this extreme the slope may diminish to less than 0.1 foot in 100 feet. Its cheapness is another

to make use of some such implement as the grader shown in figure 10 for the final smoothing and grading. If the field in its natural state is comparatively smooth and level a homemade drag or leveler, as shown in figure 11, serves the purpose fairly well.

The distribution of the ditches on the field varies too widely to admit of presenting a standard plan, but figure 12 shows an arrangement of field laterals common to the mountain States. A supply ditch, AB, is built on one side and laterals, CB and FF, branch out from it on a grade of 0.5 to 0.75 inch to the rod. These laterals are spaced 75 to 100 feet apart and are made with double moldboard plows, either walking or sulky. Figures 13 and 14 illustrate other common arrangements in use in northern Colorado.

In the vicinity of Fort Collins, Colo., the main lateral is built to the highest corner of the field to be irrigated and the smaller laterals extend out from it, spaced 75 to 225 feet apart, the spacing depending on the slope of the ground and the coarseness of the soil. The size of the laterals is governed by the head which may be had, but on steep slopes and on soil that erodes readily, small heads are best. Around Berthoud, Colo., the land is naturally of uniform, even slope, and little grading has been necessary. Heavy timber or iron drags are used to smooth the surface after plowing so that the water will spread evenly. These are built in various ways and out of whatever material happens to be available on the farm. Worn-out steel rails, such as have been removed from a railway, are often used, two rails being fastened together about 30 inches apart. A team is hitched to each end and the driver rides on the drag. Once over a field with a drag of this kind is usually sufficient to make the surface quite uniform and smooth. The proper location for field laterals is usually evident to the irrigator without the use of surveying instruments, though in fields where the fall is slight it is often necessary to have a topographical survey made and the laterals located by an engineer. Field laterals are always so located that they cover the highest and their distance apart in alfalfa varies

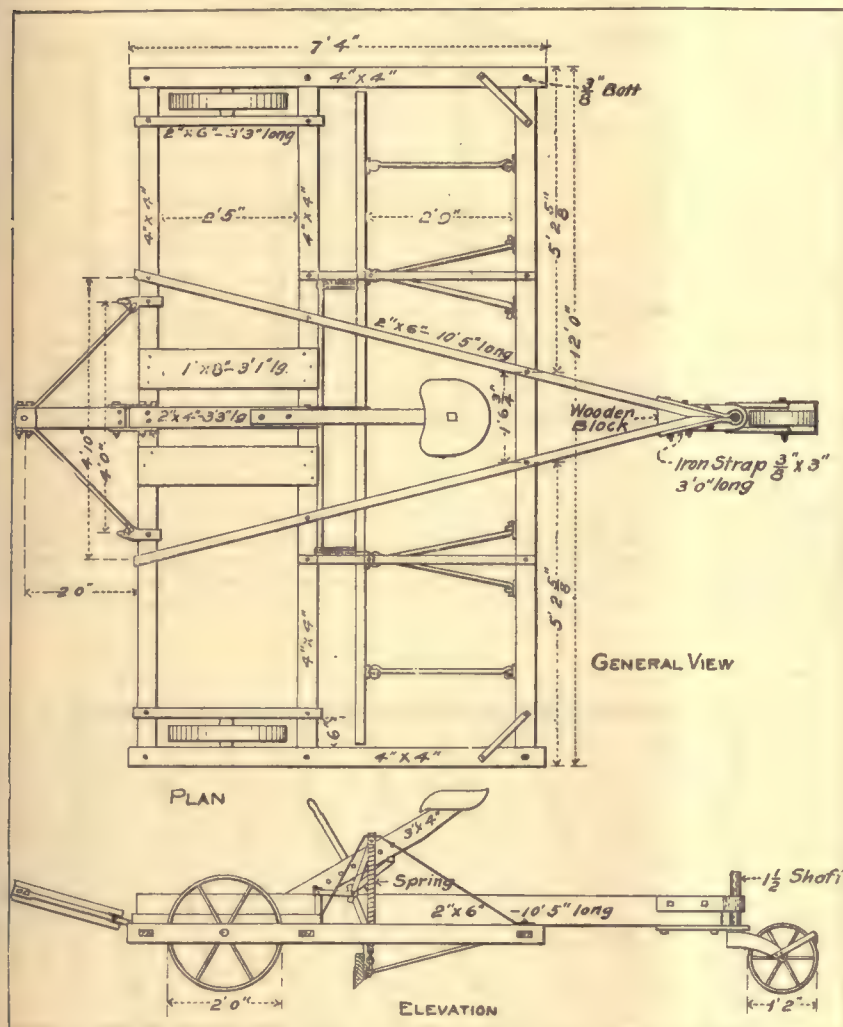


Fig. 10.—Leveler Used in Gallatin Valley, Montana.

feature which recommends it to the farmer of limited means. Ordinary raw land can be prepared for flooding at an expense of \$2 to \$5 per acre. Again, it is adapted to the use of small water supplies. In the mountain States the irrigation systems have been planned and built to deliver water in comparatively small streams for use in flooding or in furrows, and water users should be certain that the larger volumes required for checks and borders can be secured before going to the expense of preparing their fields for either of those systems.

In grading the land for this particular method it is not customary to make many changes in the natural surface. Only the smaller knolls are removed and deposited in the low places. An effort is made always, however, to make the farm laterals fit into the natural slope and configuration of the tract to be watered so as to bring the water to the high places. On steep slopes the laterals may be less than 50 feet apart; on flatter slopes they may be 200 feet or more apart. Whatever the spacing it is always desirable to have the slope between them as nearly uniform as possible. When the land in its natural state is uneven, the grading can be done best by a grader of the kind shown in attached figure 7, or a scraper of the kind shown in figure 9. When these are used, it is often advantageous

parts of the field and their distance apart in alfalfa varies from 10 to 20 rods.

The head required for flooding from field laterals in northern Colorado varies from 2 to 3 cubic feet per second and is divided between two or three laterals. Canvas or coarse manure dams are used to check the water in the laterals and to force it out over the banks and down

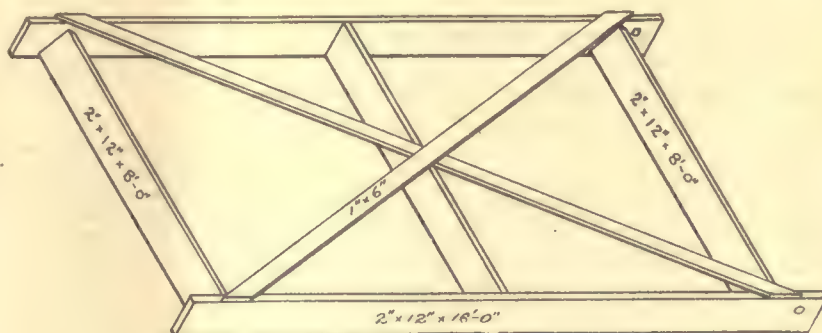


Fig. 11.—Homemade Drag or Leveler.

the slopes of the fields. In less than three hours the upper foot of soil is usually thoroughly moistened. To apply one watering in this way costs from 15 to 30 cents an acre.

In flooding clover and alfalfa fields in Montana the field ditches usually run across the field on a grade of 0.5 to 0.75 inch to the rod. (See fig. 12.) The spacing between ditches varies with the slopes, the smoothness of the surface, and the volume of water, but 80 feet is about an average. The head used is seldom less than 1.5 or more than 4 cubic feet per second, the larger heads being divided between two or three ditches. In irrigating, a canvas dam is first inserted in each ditch or set of ditches, 75 to 100 feet below the head. The water is then turned into each channel and flows as far as the canvas dam, by which it is checked and as a consequence rises and flows over the low places of the lower bank or through opening made with the shovel. When these small tracts have been watered, the canvas dam is raised, dragged down the lateral 75 to 100 feet, and again inserted in the channel to serve the next tract. Manure dams sometimes take the place of the movable canvas dams. Some time before a field is to be irrigated and after the ditching is done coarse manure is placed in small heaps within each ditch channel at suitable intervals and each heap is covered with earth on its upper face to a depth of 1 to 2 inches. When this check has served its purpose it is broken and the water flows down until stopped by the next check. In some instances permanent wooden check boxes are inserted in each lateral, while in others the canvas dam is used. The thorough irrigation of 4 acres is considered a good twelve hours' work for one man. By the use of 100 miner's inches two men can irrigate 7 to 10 acres in twenty-four hours at a cost of 45 to 65 cents per acre.

In the Salt Lake Basin the heads of water used by the irrigators of alfalfa vary considerably with the flow of the streams. In spring heads of 4 to 6 cubic feet per second are common, while later in the season, when the streams are low they are reduced to 1 to 3 cubic feet per second. A field is usually divided into strips, 200 to 500 feet wide by laterals extending across it (fig. 12). A permanent wooden check box or a canvas dam is inserted in the main supply ditch below each cross ditch, causing the water to flow into the cross ditch. From there it is spread over the surface through small openings in the ditch bank and any excess water is caught up by the next lower ditch. In this way each ditch serves a double purpose, acting as a drainage channel for the land above it and as a supply channel for the land below it.

In summarizing the advantages of the flooding method, it may be said that in first cost it is one of the cheapest, it is adapted to the delivery of small volumes of water (50 to 100 miner's inches) in continuous streams, it is particularly well adapted to forage and cereal crops of

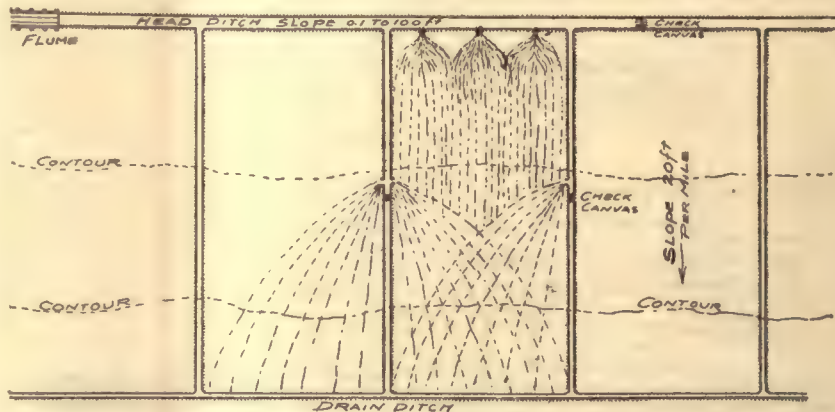


Fig. 12.—Preparing Land for Flooding in Montana.

all kinds, the top soil is not removed from the high places to fill up the low places, and firm soil, although it be on steep and irregular hillsides, can be successfully watered.

The chief disadvantages consist in the fatiguing labor required to handle the water, the small area which one



Fig. 13.—Flooding from Head Ditches in Northern Colorado.

man can irrigate in a day, the difficulty in applying water after dark, and the unequal distribution of water on the field unless more than the average care is exercised.

OREGON FRUIT FARMS PROJECT.

Great Activity in Willow River Valley—Notes on Progress.

Although the snow has been deep and an unprecedented winter has been passed all through the West, still the progress and development in the Willow River Valley has not ceased. Hundreds of men and horses have worked during the whole winter season; have graded twenty-five miles of railroad, built reservoirs; put in miles of irrigation ditches; erected hotels, stores and office buildings at Brogan.

The Spring is now here and the settlers are busy getting ready for tree planting and putting in their crops of potatoes, beets, etc. The hills are green and the whole valley is a beauty spot. While the snow has been deep, there was little or no

frost in the ground, and the moisture, instead of running down the streams, has gone into the earth, leaving it in a better condition for planting than has ever been known in this locality.

In four weeks of travel, the writer saw no place in the great progressive west that showed the advancement that was being made here. In no place did he see as good an opportunity for investment that meant sure returns to the man of push and thrift. Surely the day of the reckless stockman and the "Buckaro" is a thing of the past and gardens will bloom where waste has been heretofore on this, "The Last Frontier."

Ezra Lamb, a young surveyor in the employ of the Colorado Southern Irrigation Company, recently sustained serious injuries by tumbling 100 feet down the mountain side, in the Grape Creek Canyon, ten miles west of Canon City. It is reported that his injuries are not fatal.

New Santa Fe Trail Under Construction

Completion of this Undertaking Means
Growth for Cimarron, Kansas—
Notes of the Work.

Cimarron, an important point on the Old Santa Fe Trail, is decidedly an important point on the New Santa Fe Trail.

The name "Cimarron" is completely woven into the destiny and history of that great highway of commerce that led from Westport, now Kansas City, to Santa Fe, New Mexico. The town in Kansas bearing the name was not then in existence; but the river was. The name is suggestive to the old pioneers who trod the trail.

Near where the town of Cimarron, Gray county, Kansas, now stands, the Old Santa Fe Trail separated, the main line continuing west, through Garden City, Syracuse, and on up the Arkansas valley to Lajunta, Colorado; while the Cimarron trail, the south trail, proceeded through Gray, Haskell, Stevens, and Morton counties, and on into Colorado and New Mexico.

But these are the days of the New Santa Fe Trail.

What is the New Santa Fe Trail?

It is the greatest attempt at roadmaking in the entire West; and it revives all the tradition and sentiment and folklore of the Old Trail. The New Trail is a turnpike, a modern highway.

It commences at Wichita, with a spur from Newton, the two meeting at Hutchinson in the wonderful Arkansas valley, and proceeds almost identically along the same line as the Old Trail, running past the markers that the patriotic orders, societies, women's organizations, and school children have planted in commemoration of the Old Trail, to Lajunta, where it turns northwesterly, still in the Arkansas valley, and terminates at Pueblo, capital of the valley.

The New Santa Fe Trail is a 450-mile modern Apian Way.

The New Santa Fe Trail is making the Arkansas valley famous; and it runs through Cimarron. Cimarron men are actively identified in its making.

The New Santa Fe Trail is actually building in each of the twelve counties in Kansas and the six in Colorado through which it passes. Men are at work in every county, using King "split-log" drags, big graders, making sand-clay stretches, putting a "crown" on the road to surface it and shed the rain, putting in new cement culverts and bridges, straightening crooked places, and working through their townships, through their counties, until the succeeding townships and counties take the work off their hands. When Kansas stops at the state line, Colorado begins; and it is easier to build good roads in Colorado, because the constitution of the state permits it, while that of Kansas does not yet, though there is a popular agitation favoring such legislation. Thus a straight, continuous east-and-west highway through the famous Arkansas valley is formed, from Wichita and Newton to Pueblo.

The New Santa Fe Trail had its inception in the minds of two Kansas newspapermen of the valley: C. H. Scott, good roads editor of the Hutchinson News, and R. H. Faxon, editor of the Garden City, Kansas, Telegram. Both had been road enthusiasts, and both had worked in their localities. They conceived the idea of this highway more than a year ago, then began to manufacture public sentiment. For six months they made little headway, though continually at work. Then, one by one, two by two, and finally, by scores papers, commercial organizations, motor clubs, farmers' institutes, county commissioners, city councils, and other forces came into the movement.

The culmination was in January of this year, when more

than 300 regularly-accredited delegates met in a conference at Hutchinson, with Mr. Faxon as president and Mr. Scott as secretary. They laid the plan for the highway, clear, terse, effective, and with precise vision. It has not been changed since. The state engineer of Kansas, a representative of the government good roads office at Washington, and D. W. King of Maitland, Missouri, of King-drag fame, addressed the conference and resolutions were adopted that became the Magna Charta in roadbuilding in the West.

Colorado took hold at once, through its state highway commission and its county commissioners.

Frequent conferences and meetings of the permanent organization, which was the outgrowth of the Hutchinson conference, have been held. Mr. Faxon is president and Mr. Scott secretary of the permanent organization; and there is an executive committeeman and publicity committeeman from each county.

The great, culminating event will be April 22-23, when, from Hutchinson, Kansas, six or more motor cars will start for Pueblo, the terminus of the Trail, on an endurance run. Besides President Faxon and Secretary Scott, there will be the Kansas editor of the Kansas City Star, one of the great newspapers of the West that is giving columns of its news and editorial space to this unique and typical Western movement; Walter A. Johnson, managing editor of the Hutchinson News and representative of the Associated Press; and a group of Topeka newspapermen, with a sprinkling of motor enthusiasts and representatives of leading cars.

The running time will be twenty-five miles per hour, and the engines are not to stop enroute. Most of the cars will go through direct; some will be relayed. Arriving in Pueblo, the capital of the Arkansas valley and terminus of the Trail, messages will be delivered from the mayor of Hutchinson and the Commercial Club of that town to the mayor of Pueblo and the Pueblo Business Men's Association. A meeting will be held, the visitors will be given a hearty welcome, a good roads conference will convene, Pueblo will be shown to the visitors, and the greatest gathering in the West, in Colorado, and in the Arkansas valley this year—the Eighteenth National Irrigation Congress—will be put forth for the enlightenment of the visitors.

At the time this is being written, an inspection trip is being made over the Trail, by the state engineer of Kansas, W. S. Gearhart, and the officers and committeemen of the Trail organization.

The Trail will be complete by September, when the Eighteenth National Irrigation Congress meets, at Pueblo, the Trail terminus, and scores of irrigationists and other visitors will go to the great gathering over this great highway, by motor car.

Cimarron, therefore, as in the history of the Old Trail, is important in the days of the New Trail. County Commissioner J. S. Herron is the member of the Trail's executive committee from here, and Editor Elmer T. Peterson of the Cimarron Jacksonian is member of the publicity committee.

WILLISTON IRRIGATION PROJECT.

Reports from the government Williston Irrigation Project, North Dakota, indicate that the prospects there are brighter than they have been since the work was initiated. The farmers are organizing and outside influences are becoming interested in the section. The Amalgamated Sugar Company of Ogden, Utah, have paid several visits to the project and are very anxious to have the farmers consider the sugar proposition. The company has forwarded about 600 pounds of seed from Germany to be distributed free of charge to the farmers so that they may give the crop a thorough trial. It is proposed to build a plant as soon as the farmers agree to plant 5,000 acres to sugar beets. H. W. Puckbee & Co., of Rockford, Ill., have sent representatives to acquire property under this project and stated to the water users that they are ready to furnish 100 bushels of stock peas to be planted by thrifty farmers, they in turn to return the seed furnished, and the balance of the crop will be purchased by the company at from \$1 to \$1.25 per bushel. An alfalfa campaign is also in progress, and it is believed that approximately 1,000 acres will be seeded to this crop this coming season. Business men and banks in the city of Williston have agreed to furnish the necessary capital on personal notes of the farmers.

Artesian Well Irrigation

San Antonio, Texas

Could the ancient and the modern irrigator of Texas land gaze upon the other's achievement each must bow in admiration and respect at the forces with which each contended and the supreme knowledge each has displayed in reaching the common end—water for the parched land.

Coronado, with his intrepid band of explorers, found as early as the sixteenth century, that vast systems for the carrying and distribution of water had been constructed in southwestern Texas and had already reached a state of deterioration from long disuse. Everywhere there were traces of a civilization of which he could find no existing type of people. Remnants of artificial waterways showed proof of rare engineering skill. Yet in their construction work builders were confined to the use of the most crude and bunglesome of implements. The methods by which the ancients ran their levels and measured their distances to secure adequate water supplies, must be as

To Mr. F. F. Collins, a pioneer in the affairs of San Antonio, and with whose name the irrigation development of this section is closely interwoven, the Age is indebted for a photograph of the "Collins Gardens," occupying the center of these pages. Because of Mr. Collins' well known ability as a successful irrigator a description of conditions is of general interest.

The Collins tract, comprising 172 acres located two and one-half miles southwest of San Antonio, is irrigated from a 12-inch artesian well, 700 feet deep, the natural flow of the well being relied upon entirely for the supply, which Mr. Collins states would furnish water enough for 400 acres if the flow were conserved in a reservoir of sufficient size. The land has a fall of 10 feet to the mile east and 8 feet to the mile south. The laterals run north and south from the main canal every 300 feet. Each lateral is 1,550 feet long (the width of the tract, which is about a mile long) and about twelve rows, running east and west, are watered at a time. The well cost \$4,500, but the canal and laterals were constructed very cheaply.

The flow of the well is applied to each acre about one day in every seven, and the rental is \$15 per acre for water, house, and barn, and \$10 per acre for the land. The estimated amount applied per acre per annum is two acre-feet.

The tract owned by Mr. Collins cost \$50 per acre in



Famous Collins Gardens, Near San Antonio

interesting to moderns as the present day usages would prove to the ancients.

From the traditions of the Pueblo Indians comes the information that irrigation systems of great extent were built by the Yuma Indians centuries ago. Constant raids of the Apaches and Comanches drove this race westward again and again until at last they rested on the Colorado. At Pecos, Grand Falls and various other points in southwestern Texas the remains of these prehistoric canals are to be found.

Early in the eighteenth century, under direction of the Franciscan fathers in the vicinity of San Antonio, began the history of a later day irrigation that has developed with wonderful strides and that promises eventually to reclaim to agriculture the almost countless millions of arid acres in that state. After founding their mission at San Antonio, the Fathers directed the work of constructing ditches for irrigation purposes as early as 1716. Before 1774 considerable progress had been made in the work and fairly comprehensive systems were finished.

During the ensuing century this work was delayed and often abandoned for considerable periods. Not until 1884, when the first artesian wells were utilized, did irrigation become an important factor in the development of the arid country near San Antonio. Between the years 1890 and 1900 many artesian wells were sunk and this method of supplying water became dominant. It is found that at an average depth of 1,500 feet a copious supply of water suitable for agricultural purposes may be found.

1900 and the price was then considered high. Recently \$500 per acre has been paid for land near by. The land is divided into 12-acre tracts and the cost of a house and barn and hydrant water for each tract was about \$1,000. Mr. Collins has refused \$1,000 per acre for his farm.

It is stated that some renters clear as much as \$200 per acre. One man with help can care for 12 acres and each beginner should have \$1,000. The entire tract of 172 acres was irrigated in 1908 and 1909. In the vicinity it is estimated that 2,000 acres will be under irrigation in 1910 and 20,000 acres or more are available for irrigation in that section. Mr. Collins states that the artesian belt is limited, but that by conserving the flow in reservoirs a large scope of country can be irrigated. He believes that the slope of the land is so uniform that there will be no difficulty in preparing it for irrigation.

In a recent booklet on "Irrigation in Texas," J. C. Nagle, Professor of Civil Engineering, Agricultural and Mechanical College of Texas, makes the following observation as to the future of the San Antonio district, as well as other parts of Texas:

"Between San Antonio and the Rio Grande lie 25,000,000 acres of land, at least three-fourths of which will produce good crops. Through the Trinity, Brazos, Colorado, Guadalupe, and Rio Grande, 20,000,000 acre-feet of water annually flows to the Gulf, which is lost so far as Texas land is concerned. Besides this there are several small streams, as the San Antonio and Nueces rivers, which carry quite a volume during the early portion of

the season. To this is to be added the artesian and shallow-well supply. In large sections of the northern and western parts of the state the same unused supply is available in a somewhat smaller amount.

"It is impossible to even approximately forecast the future of irrigated farming in Texas, because of the great area of the state and the local variations in climatic and other natural conditions. Already there are upward of 400,000 acres and possibly as much as 500,000 acres under irrigation, and other systems of vast proportions are now in process of construction, besides numbers of small projects. On the lower Rio Grande development on a large scale is now most active, and it is estimated that when the systems now in process of construction are completed it will be possible to serve 180,000 to 200,000 acres or more in that vicinity alone. On the Southern Pacific Railway Company's 'Rice Belt' map, David M. Duller estimates that 100 canal systems in Texas listed on that map are capable of covering ultimately nearly 1,200,000 acres, but this includes the Brownsville region and others not now devoted to rice culture. It does not, however, cover the irrigation from wells in the coastal region, nor the central or western districts.

"If one may judge by present development, it is possible that the area now irrigated may be more than doubled within the next ten years. Many times this area

in Fremont, Pueblo and El Paso counties. Scores of engineers have been at work for weeks making surveys and preparing plans for the mammoth system that shall supply water to nearly 300,000 acres. This work is rapidly nearing conclusion and it is predicted that equipment will be on the ground and active work will be commenced within the next thirty days.

President Samuel Brown, Jr., of the well known firm of Samuel Brown, Jr., & Co., Chicago, advises a representative of the AGE that the company will have no land for sale. He states further that since December 1, 1909, his company has sold water rights at a rate of \$75 per acre to the aggregate amount of \$7,500,000. Payments for these rights extend over a period of twenty years.

By acquiring rights to nearly 500 second feet of water from the Arkansas river the company can assure the settlers an adequate and permanent water supply. It is proposed to construct a series of twelve reservoirs to store the flood waters of this stream.

Contracts for construction work involve the building of nearly 150 miles of ditches. A recent announcement by the company states that Kenefick, Quigley & Russell, of Kansas City, were the successful bidders.

While Mr. Brown, the president of the company, is well known in financial circles and in the east, Dal Deweese, of Canon City, has been the chief promoter and the active agent in arranging the details of the plan. Mr. Deweese has made



Results of Irrigation by Artesian Wells.

will doubtless be developed in the state eventually, provided the required amount of water can be conserved in the arid and semi-arid portions, and even in the humid and semi-humid districts the use of water will gradually be extended, not only for rice cultivation, but for the assistance it will render in fruit and truck growing, and even in the cultivation of staple crops. In such cases irrigation will serve as a species of insurance against periods of drought, even though the normal rainfall be sufficient ordinarily for the production of excellent crops."

GIANT COLORADO PROJECT.

At Cost of Millions, Private Company Projects the Reclamation of 300,000 Acres.

Announcement that the issue of bonds has been placed with a prominent Chicago bonding house, and that contracts for work aggregating more than \$12,000,000 have been let during the past month, brings to the attention one of the greatest of Colorado irrigation projects. In cost of construction the private project will double that of the government in connection with the famous Gunnison tunnel.

In recent issues of the IRRIGATION AGE notes of the formation of this company were given to readers. The Colorado Southern Irrigation company has acquired large land holdings

his home in Colorado for many years and has acquired considerable fame as a hunter and some renown, during late years, as a horticulturist. He is a personal friend of Col. Roosevelt and is the originator of the Colorado Orange apple.

The head offices of the Colorado Southern Irrigation Company will be at Canon City.

ENGINEER STEPHENSON RESIGNS.

From Boise, Idaho, comes the semi-official announcement that State Engineer James Stephenson, Jr., has tendered his resignation to become effective within the next thirty days. It is reported that he has decided to interest himself in a private company and that he will shortly remove his residence from Boise to Chicago.

Mr. Stephenson was appointed engineer in 1907 for a period of four years. During his tenure of office the work of reviewing plans and superintending matters related to Carey Act projects has largely increased.

Newspapers in Idaho express regret at the probability of his early resignation. It is a recognized fact that Mr. Stephenson has so organized the engineer's office that it is of great value to the state and has a most important bearing upon Idaho's future development.

Reports indicate that Daniel T. Martin, of Idaho Falls, is a candidate for the prospective vacancy. Mr. Martin has had experience in the work by reason of his connection with the State Land board.

Reclamation Notes

COLORADO.

Lee and Robert Pricer have planned the construction of a reservoir near Rogan, to irrigate 2,500 acres, at a cost of about \$5,000. They will also construct ditches at a cost of \$3,000.

Articles of incorporation have been filed by the Carr Reservoir and Irrigation Company of Dover. Capital stock is fixed at \$100,000. Archie F. Finley, C. C. Rogers, Chas. F. Finley are incorporators.

The Huerfano Reservoir and Irrigation Company recently filed articles of incorporation, showing capital stock of \$250,000, with principal offices at Denver. Lemuel J. Husted, Frank M. Keeger and Otis Beverstock are incorporators.

The Fox-Smith Construction Company has agreed to complete the Shaffer dam for the Beaver Land and Irrigation Company, at Florence, before August 1. The original contract called for completion on June 1, but owing to the weather conditions it was found necessary to postpone this date.

The Jumbo dam of the Jumbo irrigation district, six miles east of Sedgwick, was washed out on March 17, causing damage estimated at \$40,000. About five miles of the Union Pacific track were destroyed. It is proposed to rebuild the dam at once in order to insure a water supply for the present season.

Plans and specifications for the Surface Creek and High Line canal have recently been filed at Montrose. It is proposed to increase the water supply for the use of the Surface creek district in Delta county. Surplus water from the Grand Mesa will be conveyed to the creek. Robt. W. Curtis, B. S. Blanchard, Clarence Dillon and Philip Stephens are interested.

Final filings have been made by Steven C. Scott, in behalf of the Bent and Powers Irrigation district, of which he is president. Plans involve the construction of three dams across the Purgatoire river at an estimated cost of about \$800,000. It is proposed to construct ditches at a cost of \$1,600,000. Grandby Hillyer of Lamar is secretary, and F. H. Whiting of Denver is engineer in charge.

County Judge Jos. Newitt, of Chaffee county, recommends that the state construct reservoirs about 150 miles up the Cotton Wood Creek from Buena Vista, for the purpose of supplying water to about 2,000 acres near that city, and to supply light and power for the State Penitentiary. The recommendation has been referred to the State Penitentiary Board. He also suggests the construction of a dam.

Work has started on the Toll gate reservoir, located east of the city limits of Denver. About 11,000 acres, part of which is within the city limits, will be supplied from this source. The estimated cost for construction is \$300,000. Reservoir, ditches and water rights are the property of A. D. Annis and J. A. Simonson. Lands were formerly watered by the old English high line canal, but the new reservoir will insure a better supply. Land owners have agreed to estimates.

The Costilla Estates Development Company, with holdings in the San Luis valley, has let the contract for construction work, to the Wilcoxon-Wogan Company, of Kansas City. The cost of the reservoir on the Culebra river is estimated at \$500,000. Officers of the company are: Frank E. Brooks, President; Gerald Hughes of Denver and Judge Horace G. Grant of Colorado Springs, Vice Presidents; and H. Alexander Smith of Colorado Springs, Secretary; and Fred G. Moffitt of Denver, Treasurer. Eastern capitalists are interested.

It is announced that the Colorado Southern Irrigation Company has let the contract for the construction of an irrigation system for that company, and the Canon City, Florence and Pueblo Water Company, to Kennefick, Quigley & Russell of Kansas City, for \$12,987,000. According to the terms of the contract, the work must be completed by April 1, 1911. The system involves twelve reservoirs and a 60-mile main

canal, with 30 miles of diversion canals. The reservoirs will have a storage capacity of 750,000 acre feet, and will be sufficient to irrigate 300,000 acres in the Arkansas valley.

Recent reports in the Denver papers state that the Southern Colorado Irrigation Company, which has been organized for the construction of irrigation projects in Chaffee and other southern Colorado counties, has interested itself in the Montrose & Paradox railroad. This report is denied by Sam Brown, Jr., secretary of the irrigation company, who states that his firm is not financially interested. Reports in the Denver papers also indicate that the Southern Irrigation Company plans several small projects in the southern part of the state. Plans have been formed for a 40-mile canal to convey water from the San Miguel river to a large reservoir and for the construction of radiating ditches at a cost of \$500,000.

CALIFORNIA.

The Natomas Consolidated Company is reported to have floated bonds in London for reclaiming 80,000 acres of land in the American basin above Sacramento. This tract lies east of the Sacramento river, and comprises some of the finest lands in the state. Plans include great dikes to protect lands from overflow.

T. W. Patterson of Fresno has recently completed a pumping plant in Stanislaus county, at a cost of \$250,000, capable of watering 18,000 acres. The method employed by Mr. Patterson and the construction company are being inspected by land owners in other arid sections with a view to taking similar steps to obtain water.

By the completion of a line to Meridian, in Sutter county, the Pacific Gas & Electric Company expects to interest the farmers of that section in the use of power for irrigation. The company has made arrangements to water thirty acres near the town of Meridian by means of motor and pump installed on the bank of the Sacramento river.

A canal to irrigate 6,000 acres north and east of the city of Marysville has been projected by farmers. Seven thousand miners' inches will be diverted from the Yuba near Daguerre Point. It is said this will be one of the cheapest irrigation systems in the entire valley, the engineer estimating that it can be built for a sum ranging between \$10,000 to \$12,000. All the rights of way have been secured, and active surveying and construction work will begin without delay.

IDAHO.

Land owners north of Pocatello, under the Ft. Hall Irrigation Project, believe that through the efforts of Senator DuBois, water will be supplied at a rate of \$6.00 per acre. It was originally intended to charge \$18.00 per acre.

Settlers on the Idaho Irrigation Company's project will receive a rebate for all lands that are not placed under water. Representatives of J. G. White & Co. have recently made an investigation and arranged for surveying lands to determine what rebates are necessary.

It is announced that the final surveys on the mammoth American Falls Project have been approved by the Secretary of the Interior, and that work will be started on the project at once. The cost of this project is estimated at \$20,000,000, with 600,000 acres of land to be reclaimed.

In a recent court action at Mallard, wherein the Onida Irrigation District sued Geo. C. Parkinson and Arthur W. Hart for accounting, a verdict was returned in favor of the defendants. It is claimed that these officers used the Irrigation District's funds for the purchase of property at \$29,500, which was later sold at \$40,000.

Members of the State Land Board recently made an inspection trip over the lands under the Oasis Land and Irrigation Company's project in Millard county, to determine whether or not sufficient progress had been made for land opening. Latest reports indicate that the board was satisfied, and will arrange for an opening in the near future.

Chas. H. Paul, project engineer on the Minidoka Project, has executed a contract, on behalf of the United States, to furnish a water supply to the town of Heyburn from the government irrigation system. The length of season during which water is to be furnished is from April 15 to October 15.

Under the terms of the contract the town agrees to pay to the Reclamation Service \$1.50 per acre foot.

MONTANA.

After two months' cessation of work because of cold weather, the Bitter Root Valley Irrigation Company has resumed operations in the Burnt Fork district near Stevensville. It is predicted that the ditch will be completed this summer.

The Secretary of the Interior has awarded contract to the Des Moines Bridge & Iron Company of Des Moines, Iowa, for furnishing material for the construction of three highway bridges in connection with the Milk River irrigation project, at a contract price of \$1,002.

Stockholders in the Ashley Lake Irrigating Company have perfected a reorganization into the Ashley Irrigation District. It is proposed to issue \$50,000 in bonds. The entire holdings of the old company, consisting of dam and canal, is now under control of the legally organized district. Lands in Smith valley, an arm of the western side of the Flathead valley, are affected.

Farmers in the Glen Lake Irrigation District have perfected an organization with a view to issuing bonds to the amount of \$100,000 to reclaim 4,300 acres. It is claimed that L. W. Hill, of the Great Northern, will take the bond issue at 96 per cent of its par value. Directors elected by the district are: F. P. Garey, Chairman, N. P. Shenefelt, A. T. Purdy, L. B. J. Chapman, all of Lincoln county.

The government's Sun River Project is brought into prominence by reason of the projected construction of a railroad line to be extended from Great Falls up the Sun River Valley to Augusta. This line will traverse the Fort Shaw unit already open to entry. The railway company announces that work will be started on the grading of the roadbed in the immediate future. The Reclamation Service is assembling equipment with which to build the Willow Creek dam, steam shovel, locomotive and an outfit of cars. When complete the structure will have a height of 110 feet, length of crest of 1,045 feet, and will contain 437,000 cubic yards of earth. The storage capacity of the reservoir will be 84,000 acre feet. The unregulated water supply of Sun River is abundant for immediate requirements, but the rapid settlement of the project predicts the need for additional water in the near future which is being attempted by the government and the work will be constructed in advance of any requirements. The number of homestead entries made on adjacent dry farming lands were: 1,375 in October, 1,411 in November, 1,028 in December, 1,012 in January and about 2,000 in February. The construction of the Billings & Northern Railway to Great Falls, which is one of the links of the transcontinental Gulf of Mexico to Puget Sound line of the Hill system, is giving a great impetus to settlement.

NEW MEXICO.

The Willard Irrigation Company, a concern formed for the purpose of constructing a pumping plant for irrigation purposes, has recently filed articles of incorporation. The capital stock is placed at \$1,170,000, divided into 26,000 shares. The incorporators are as follows: B. F. Heilin, W. E. Beel, W. A. Dunlavy, Frank C. Kettles, Alfred L. Means, J. J. Watkins, Sam Hunter and Joe Sains.

Success of the experiments in pumping for irrigation at Portales has resulted in the investigation of conditions by land owners in Curry county. C. R. Worrall, president of the Commercial Bank and Trust Company at Clovis, is authority for the statement that experiments will be conducted in Curry county during the present year, with a view to the installation of numerous pumping plants.

Under the auspices of the Albuquerque Commercial Club there has been framed a protest against the appropriation by the government of funds for work on the Elephant Butte dam. This protest will be sent to Washington. New Mexicans declare that if this project is carried forward only 110,000 acres will be irrigated, wherein, if filings are allowed in New Mexico, nearly 400,000 acres may be placed under water.

H. C. Kinsell and J. W. Reeves of Stanley, in the southern part of Santa Fe county, have made application to Territorial Engineer Sullivan, for water rights on the Armijo Arroyo, east of Stanley. It is proposed to store the flood waters on the co-operative basis, at a cost of about \$110,000. The area to be reclaimed includes 13,000 acres. The height of the dam will be 85 feet, length on top 1,885 feet, and at base 143 feet. Applicants ask 42.92 second feet of water. Corbett & Smythe of Santa Fe have made surveys.

Waterpower and irrigation properties in Texas for sale.

\$7,000 to \$30,000

Real worth \$25,000 to \$100,000

WADE B. LEONARD,
DALLAS, TEXAS

Farmers in the vicinity of Estancia have signed for 3,000 acres to be irrigated by pumping. Representatives of contracting company at Wichita, Kan., have made a definite proposition, and it is understood that owners of about 20,000 acres have signified their intention to join the organization if initial experiments are successful. Promoters claim that 10,000 acres will be necessary before the plant can be constructed. Incorporators of the Estancia Valley Irrigation Company are: Lucius Knight, Fred H. Ayers, H. G. Souders, A. J. Green, Thos. Law, J. M. Shaw, R. O. Soper, Wm. McIntosh, W. W. Wayne. Capitalization is \$1,170,000.

OREGON.

The Oregon Irrigated Land Company, with principal offices at Echo, has recently filed articles of incorporation. Capital stock is fixed at \$5,000. Incorporators are J. W. Mesner, W. J. Stapish, Claude A. White.

The Commercial Club at Eugene has passed resolutions favoring irrigation in the Willamette valley. Definite plans for the construction of a comprehensive system have not yet been formulated. It is proposed to incite interest in a local irrigation project.

Spokane men are interested in a new irrigation project in the Rogue river valley. It is claimed that the supply is normally adequate, yet a system of canals will insure larger crops. Land owners are agreeable to the formation of a company to prosecute this work.

Incorporation papers have been filed by the Orchards Water Company at Vale, showing capital stock \$50,000. It is proposed to acquire water rights for irrigation and power purposes. The main office will be at Brogan, Malheur county. Incorporators are R. B. Hoyt, F. L. Grimes and E. R. Hamilton, all of Vale.

On charges that the company has violated its agreement regarding water supply, settlers are suing the Columbia Southern Irrigation Company for violation of contract, and to secure the appointment of a receiver. Interest centers in

TRUMP TURBINES



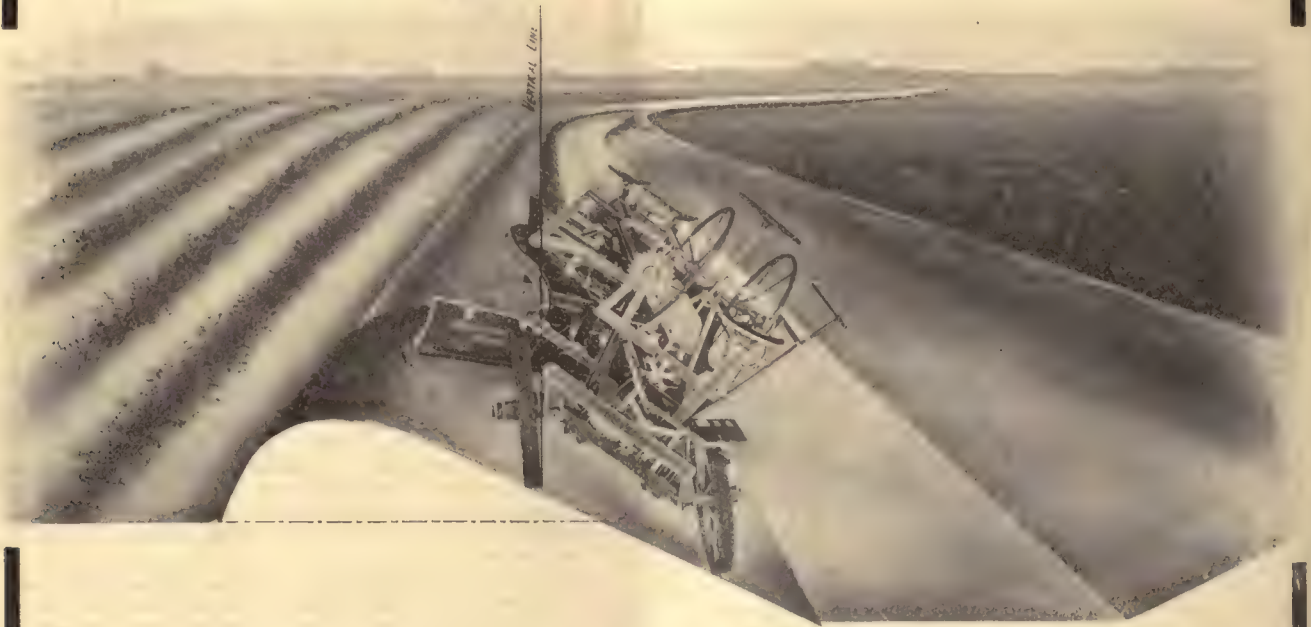
When used for driving centrifugal pumps for irrigating purposes, either direct connected horizontally or vertically, or for furnishing power through other types of transmission, will be found to be the most economical and highest grade type of water wheel machinery manufactured in this country. These turbines are adaptable to the severest of condition.

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This type of machine is different from all other ditching machinery, in that it plows the dirt out of the ditch with a continuous sweeping motion, whereas all other machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The cost therefore, per cubic yard, of excavating with the U. S. Reclamation Ditcher is necessarily much less than with any other tools or appliances.

The Reclamation Ditcher is adapted to cutting ditches as deep as three feet below the original surface and as wide as ten feet at the bottom and with sides sloped as steep as 2 to 1.

It has adjustable oblique wheels which perform the same function as the oblique wheels of a sulky plow. They are simply rolling landsides which counteract the side pressure of the earth on the mold and also make it possible for the machine to be operated on the sloping side of the ditch as shown in the cut.

It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

The difference in cost of cutting ditches with the Reclamation Ditcher and any other form of machinery is sufficient to pay for the machine very quickly. We absolutely guarantee this and will prove it to you by a demonstration of the machine on your own work before you accept it.

Write for descriptive folder which gives diagrams of ditches and cost estimates.

J. D. ADAMS & CO., Indianapolis, Indiana

the action brought by F. R. Hanke for the recovery of payment amounting to \$937.00. Other settlers are watching the progress of this case with great interest and are assisting in the prosecution.

Reports from Hood River state that the Dee Irrigation and Power Company has won in its controversy with Mr. W. R. Winans over the water-rights on the west fork of the Hood river. The Dee company had already completed about two-thirds of its main ditch. Mr. Winan had filed on the waters for power purposes, and it is claimed had planned the organization of a \$1,000,000 company. The land to be watered by the Dee company consists of about 25,000 acres, formerly covered with forests, and owned at that time by the Oregon Lumber Company.

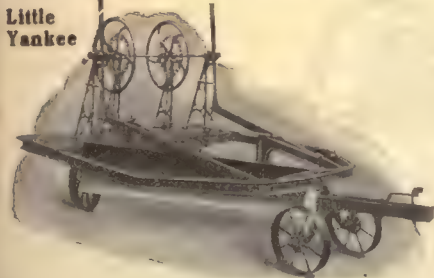
At a hearing before the Oregon State Land Board recently, the East Oregon Irrigation Company, with headquarters at Boise, was authorized to proceed with its project for the reclamation of a large tract in Eagle Valley, Baker county, Oregon. This company, headed by McCreedy Sikes of Boise, made investigations and survey some time ago. Upon presentation of their request for segregation, another company appeared and asserted that by diverting waters of Pine creek, they could reclaim a portion of the land at less cost. This latter plan was rejected by the State Land Board, and the Boise Company is now in a position to begin construction work. It is claimed that about 30,000 acres will be brought under water. Officers of the East Oregon Irrigation Company are as follows: McCreedy Sikes, president, of Boise, Idaho; Edward M. Blake, manager, Boise. A. H. Brickentien, of Boise, is general counsel for the company.

UTAH

About 24,000 acres in Emery county, on what is known as the Buckhorn Irrigation Project, will soon be open to entry. This land is situated about twenty-three miles south of Price Station, in Carbon county.

Work has been resumed on the Weber-Davis county canal,

THE YANKEE WAY



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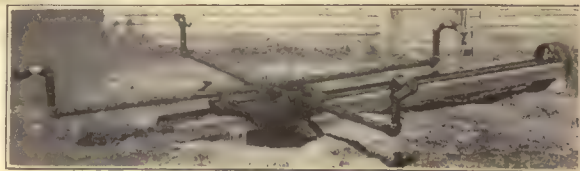
These lands are being rapidly taken up and ere long all of the Government lands will be gone. Thereafter land will be possible of acquirement only at prices phenomenally high compared to those of to-day.

OUR PERSONALLY CONDUCTED EXCURSIONS on the first and third Tuesday of each month and cheap homeseekers' tickets on those dates, allowing stop-overs in both directions, will give you an opportunity to examine the irrigated lands and the Mondell lands on one trip.

OUR NEW FOLDERS WITH MAPS, showing the location of all of the above-mentioned lands and explaining in detail the crops raised, the natural resources of each locality, and the method of procedure to acquire title, will be sent to you, free for the asking. Write for them to-day. Free for the asking.

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N. B. The winter weather in the Big Horn Basin Country is fine and lands can usually be seen to advantage all Winter.



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and it is predicted that the work will be completed by May 1. W. M. Bostaph, civil engineer, is in charge of the construction work, with headquarters at Ogden.

The Sunnyside Reservoir Irrigated Land and Live Stock Company has filed application for 16 acre feet of water from the Cottonwood wash in Carbon county. The company is planning the construction of a reservoir near Sunnyside.

Fruit growers near Green River have formed an irrigation district, known as the Green River Mutual Irrigation Company. The county commissioners set the date for election on April 19. E. D. Rovers, E. H. Lyons and J. H. Briscoe presented the petition.

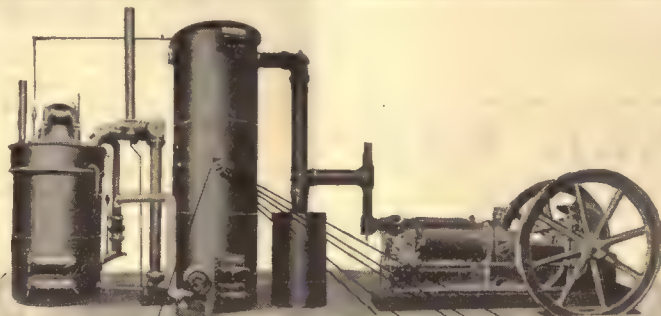
The city of Salt Lake was successful in its suit against the East Jordan Irrigation Company in securing denial of the court for a dismissal of the case. The city seeks to condemn the canal for city uses, and an expenditure of \$200,000 for enlarging the canal, is involved in the action.

By decision of the district court at Ogden in the action brought by the Wilson Irrigation Company against Joseph and Wm. Jenkins, to prevent the using of 67 second feet of water from the company's canal, it was held that the Jenkins have no legal rights, and judgment in favor of the company was entered.

The Ogden City Council has been petitioned by the Plain City Irrigation Company for an exchange of sewer water for water owned by the company in Weber river. It is claimed that this sewer water will be used for irrigation purposes, as it is more valuable than that from the river. The petition was not granted.

Land commissioners have recently leased the Hatchtown reservoir in Mallard county, to land owners in Richfield, who are interested in the Piute Land and Irrigation project. This reservoir is now under option to Richfield parties, but it is provided that the board has a right to make a lease for the period of one year. About 2,000 acres may be watered.

Under the provisions of the Carey Act, the Sevier River



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Land and Water Company will open about 50,000 acres to entry on April 11. Much of this land lies at Lyndall, formerly known as Lynn Junction, 118 miles from Salt Lake on the Santa Fe road. The company has water rights sufficient for the irrigation of 75,000 acres. A comprehensive system of dams and reservoirs is under construction.

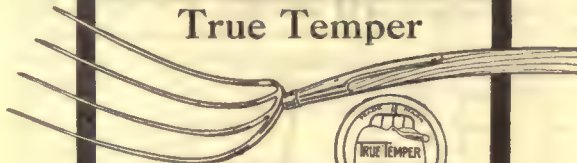
J. C. Stewart, of Kleybolt & Co., bankers, is authority for the statement that work will be started within sixty days in Beaver county, on what is known as the Beaver River Irrigation, Land & Power Company's project. About \$1,250,000 will be spent in the reclamation of 20,000 acres. One reservoir will be located at Minersville, and another several miles up the valley. Construction work will be completed within one year.

Reports from Provo state that the Sego Irrigation Company has filed articles of incorporation showing Provo as the principal place of business. Capital stock is fixed at \$48,000. Directors are Jas. Clove, president; C. E. Loose, vice-president; Preston Peterson, secretary; W. L. Biersach, treasurer; and A. L. Woodhouse. The company has purchased the rights of the Timpanogas Irrigation Company, and has also arranged with the Telluride Power Company for the supply of water.

The Secretary of the Interior has authorized the approval of a contract entered into by J. L. Lytel on behalf of the United States with James W. Clyde et al, providing for the lease of certain lands in the Strawberry Valley, for grazing purposes. The lands are to be used for grazing purposes only, and during the term of the lease not more than 25,000 head of sheep shall be pastured on the premises at any one time. Horses and cattle grazed on the land shall each be considered equivalent to six sheep. The sum of \$10,600 is to be paid for the use of these lands.

Stockholders of the Irrigated Lands Company and the Price River Irrigation Company have filed suit against John Y. Smith, Chas. Tyng, George A. Smith and Thos. Austin, charging that these officials have been neglectful of the trust and have conspired to defraud investors. Jas. H. Burtner

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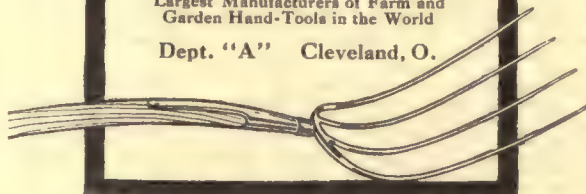
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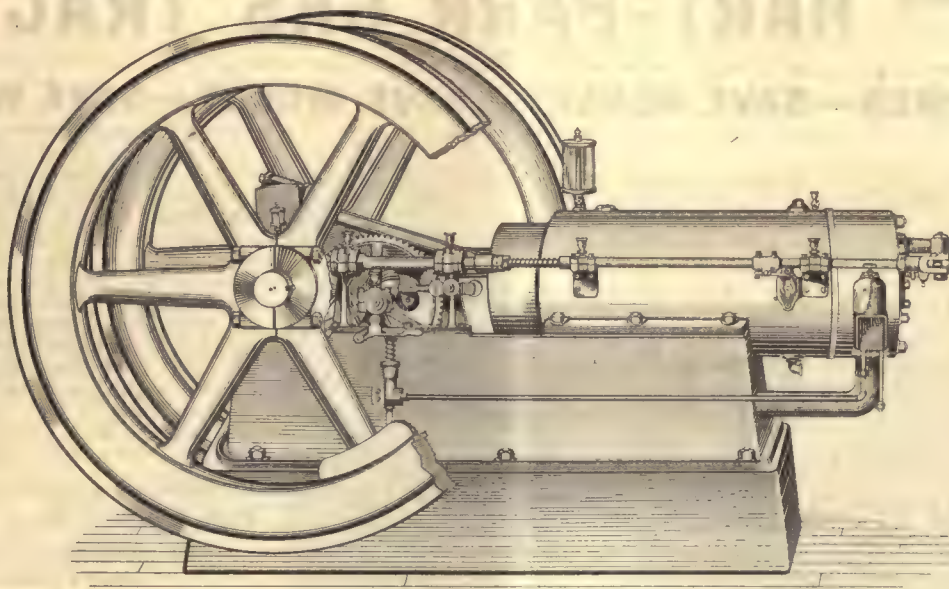
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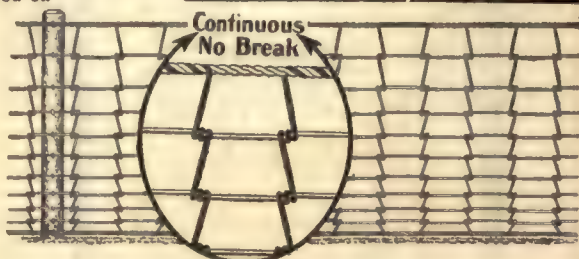
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represents the stockholders in the court action. It is alleged that the defendants, who are stockholders in both concerns, have transferred property from the Irrigated Lands Company to the Price River company to the financial loss of stockholders in the former concern. Mr. Burtner asserts that the Irrigated Land Company is insolvent. He asks the appointment of a receiver, and that directors be enjoined from collecting further assessments.

WASHINGTON.

E. D. Mineah, president of the Land Owners' Association, at Hussum, states that 170,000 acres have now been signed, but that the full 250,000 acres must be secured before work on the Klickitat canal can be commenced. In a recent statement he predicted that operations would be begun early this spring.

J. T. Buffington of Mabton has arranged to drill a test artesian well two miles east of Attalia, to learn whether a supply of water for irrigation can be secured. It is claimed that other land owners in this district are watching the experiment with a view to installing similar systems if it is successful.

Land and water rights in Stevens county, formerly owned by the Upper Columbia Irrigation Company, have been purchased by S. W. O'Brien of Spokane for about \$400,000. Members of the company, represented by Mr. O'Brien, are unknown, but it is claimed that large tracts of land in this district will be placed under water.

The Reclamation Service will rent water for the coming season under the Sunnyside Irrigation Project for use on lands outside the unit to be opened to irrigation in 1910. It is estimated that there will be sufficient surplus water,

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after complying with the contract requirements, for the irrigation of nearly 1,000 acres. Many applications have been received from persons who have made improvements in good faith on the assumption that they would be able to obtain water upon application. A charge of \$2.50 per acre per annum will be made for water supplied on the rental basis.

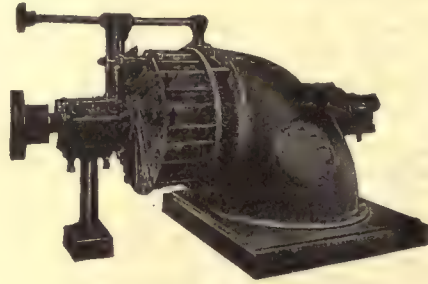
The Secretary of the Interior has fixed the maximum unit for the subdivision of excess private lands under the Tieton irrigation project, at forty acres of irrigable land, and has directed that the public lands be divided, as far as practicable, into farm units containing not more than forty nor less than twenty acres of irrigable land. Land owners under the Tieton project will be permitted to retain eighty acres of irrigable land. It is expected that early this summer it will be possible to prepare for promulgation before the irrigation of season of 1911, township plats showing the irrigable lands, public and private, which can be placed under irrigation under the provisions of the Reclamation Act during the irrigation season of 1911. The soil of this section is volcanic ash, overlaid with hard pan, and is considered exceedingly fertile. The climate is mild, with only occasional extremes of heat and cold. The growing season is long and practically rainless, and the principal products are hay, hops and fruit. The general belief is that the Tieton lands will be used largely for fruit raising, and old farmers in that vicinity consider that ten acres of fruit lands are sufficient for a family. The chief markets are the Puget Sound cities, Spokane and the East. Hay is usually shipped to the Sound, and the bulk of fruit and hops goes to the East.

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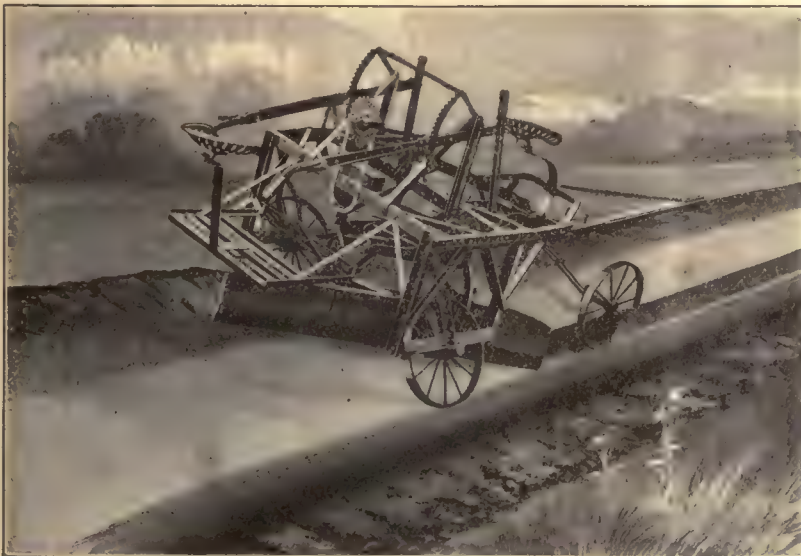
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WYOMING.

A committee, representing the Albany County Water Users' Association, have begun preliminary steps for filing suit in the United States District Court, to contest the right of Colorado irrigators to divert head waters of the Big Laramie in that state. The base of this suit is the fact that all available waters of the Big Laramie have been appropriated in Wyoming.

Construction work on the main canal of the Wyoming Central Irrigation Company, it is predicted, will be started in the near future. This canal will be 50 miles in length, and will water approximately 240,000 acres in the vicinity of Riverton. It is said that 40 per cent of land owners have signed for water.

The North Platte Valley Irrigation Company has let the contract for construction of a siphon to carry water from the La Prele ditch in the Platte river, to water about 5,000 acres on the Douglas side of the river. Allen & Co., of Denver, were the successful bidders. This siphon will be of California redwood, 2,200 feet in length and four feet in diameter, and will be located about six miles south of Douglas.

The Reclamation Service will build structures of various types at numerous places along laterals under the North Platte Irrigation Project. The structures consist of concrete drops, turnout gates, bridge piers, culverts, flumes, etc. It is estimated that the total cost will be about \$40,000.

Bids will be received, closing about April 15, for the construction of the Covey canal, near Cokeville. Approximate quantities—of excavation, earth 75,000 cubic yards; loose and solid rock 2,000 cubic yards. Information can be obtained from W. Newbrough, M. Am. Soc. C. E., chief engineer, or from S. M. Covey, 933 East First South street, Salt Lake City.

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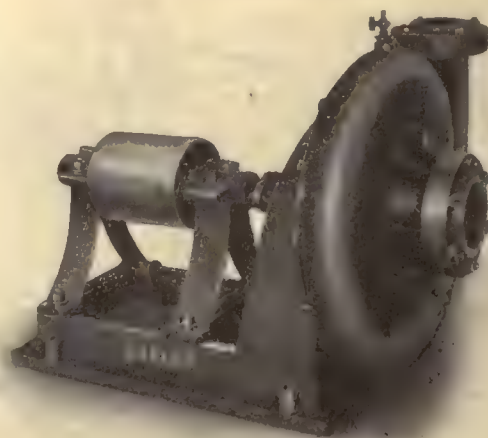
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(Continued from page 252.)

two ways: (1) by selling their lands at a greatly enhanced price, and (2) by disposing of water rights to the settlers upon government land within reach of their canals. Many of the canal corporations have been far-sighted enough to so construct their canals with branches and laterals, that, by owning a few thousand acres they could control hundreds of thousands of acres of undeveloped and government soil. While this is an important factor in the profit of the investments, the ultimate object of the present day corporations is the enhancement of the value of their own lands.

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Sub-Surface Packer,
the only one
made.

This is
the one
that you
have heard
everyone talk-
ing about.

P & O CAMPBELL SUB-SURFACE PACKER

Send for our Special Pamphlet on Sub-
Surface Packing, the best known system
for "dry farming," a method of absolutely
insuring bumper crops with a minimum
rainfall—the salvation of semi-arid regions.

Made in Three Sizes, with 10, 16 and
24 wheels, is heavy and strong, and the
frame is made to carry all the extra weight
required. Write for Catalog No. V 151

Parlin & Orendorff Co.,
CANTON, ILL.

**Splendid Trees
and Shrubs**

FREE

We have made some remarkable offers in connection
with our magazine in the past, but never one that com-
pared with this. You will want to snap this one up quick.
The collection we are going to give you, if bought at retail
from a Nursery would cost you several dollars. We have con-
tracted for a large number of these collections and propose to
give the entire seven trees and shrubs away, absolutely **FREE**
to new subscribers to The Fruit-Grower, for the purpose of creat-
ing a greater interest in horticulture. Here is the collection
we offer you **FREE**:

- No. 1—One Winter Banana Apple Tree—Fine, vigorous grower,
fruit medium to large; smooth; color a bright golden yellow.
- No. 2—One Liveland Raspberry Apple Tree—Best summer ap-
ple; orange-yellow; striped, splashed with rich red; flesh fine.
- No. 3—One Little Grape Vine—Succeeds both north and south;
vigorous; deep red; heavy bearer; berries large and tender.
- No. 4—One Tulip Tree—A magnificent native tree of tall,
pyramidal shape; tulip-like flowers; allied to the Magnolia.
- No. 5—One Spirea Van Houttei—Finest of all Spireas. In
May and June plant is covered with beautiful white flowers.
- No. 6—One Hydrangea—Comes into bloom just when there
is a scarcity of white flowers; blooms very freely.
- No. 7—One Rose, General Jacquemont—One of the very
hardest and most popular; velvety crimson; very vigorous.

They are exceptionally fine one-year plants—will be care-
fully bundled and sent **FREE**, all charges prepaid, to any-
one who accepts this offer and sends us \$1 for 1 year's sub-
scription to The Fruit-Grower, \$2 for 3 years, \$3 for 5 years,
or \$5 for 10 years. You will be delighted with the collec-
tion, while each issue of The Fruit-Grower will be worth
several times the year's subscription price to you if you are
the least bit interested in farm, fruit or flowers. The Jan-
uary issue was our Annual Spraying Number; February issue
our Annual Gardening Number—either issue worth \$1.00 to
anyone who plants a tree or a bed of vegetables—we will
send sample copies **FREE** as long as they last. The Fruit-
Grower is acknowledged to be the world's greatest fruit and
farm magazine, beautifully printed and illustrated, monthly,
and consists of from 60 to 100 pages each issue.

This free tree offer is open to everyone—it is our greatest
offer and effort to create more interest in horticulture and
to make new friends for The Fruit-Grower. All we ask in
addition to the subscription price is that you send us the
names of five friends or neighbors who are also interested
in horticulture, so that we may send them **FREE** sample
copies of The Fruit-Grower to let them see what a helpful
magazine we are publishing. Our magazine alone is worth
more than the money you send, and we give the plants
mainly to secure your good will and names of fruit-growers.

Read the description of the trees and shrubs and remem-
ber that you get all Seven of them **Free** with a year's sub-
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or if you are not acquainted with The Fruit-Grower,
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and write the word "Sam-
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Enclosed find \$.....
for..... year's subscription
and **FREE** collection of Trees
and Shrubs as per your offer. List
of names is also enclosed.

Name.....
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C.D. Butchart

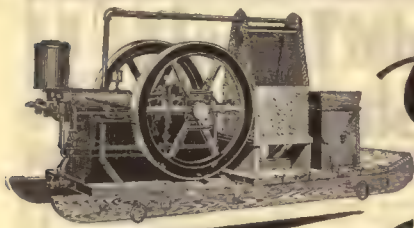
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For Irrigation Systems and Water Works

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Against Irrigation
Uncertainty**

You can avoid the doubts and uncertainty of water supply and insure your growing crops with a Famous

I H C GASOLINE ENGINE

Be an independent farmer on the water supply question.

Put yourself in that position, with an I H C Gasoline Engine, where you can pump your available water to wherever it will do the most good—whenever your crop needs it.

With very little attention—between times and at small expense—these powerful and reliable engines will relieve you of the greatest trouble and worry of irrigated farming.

With an I H C Gasoline Engine you can be independent of the supply in the company ditch. You have a permanent or quickly available water supply force of your own. You can irrigate wherever and whenever you please and just when it is most needed.

Otherwise you are at the mercy of conditions that you cannot possibly change in any other way.

And of course an I H C Engine

will do all kinds of other work for you—powerful and handy for every purpose—saves extra horses, extra hired help and your own extra labors, paying for itself very quickly in sawing wood, grinding, separating cream, running fanning mill, washing machine, churn, grindstone and other machines.

The I H C Line includes besides Famous pumping engines and jacks the following:

Stationary engines from 1 to 25-horsepower; Portable engines from 2 to 25-horsepower; Skidded engines from 1 to 8-horsepower, Tractors 12, 15 and 20-horsepower and Sawing and Spraying outfits.

Call on the I H C local agent for catalogues and all particulars in regard to these engines, or write the International Harvester Company of America at nearest branch house.

WESTERN BRANCH HOUSES:—Denver, Colo., Portland, Ore., Salt Lake City, Utah, Helena, Montana; Spokane, Washington; San Francisco, California.

INTERNATIONAL HARVESTER COMPANY OF AMERICA

(Incorporated)

Chicago U S A



**THE
I-H-C LINE**

LOOK FOR THE "I. H. C." TRADE MARK. IT IS A SEAL OF EXCELLENCE AND A GUARANTEE OF QUALITY.

BIG BEND PROJECT.

Mr. Joseph Jacobs, consulting engineer of Seattle, Wash., has completed the preliminary survey for an irrigation project on the Quincy flats, Grant county, Washington, on what the Reclamation survey has called the Big Bend project. His report covers a project of 290,000 acres, lying in one contiguous body without hills, ravines or any other defects, to prevent cultivation.

The project calls for an outlay of \$100 per acre for water, but this is satisfactory to the settlers, for within fifty miles is the famous Wenatchee Valley, where land has sold for \$3,000 per acre and the land embraced in the Quincy project is said to be better, with a longer season, and an altitude of 1,000 to 1,300 feet.

Experts claim that this will be an ideal winter apple country. Water

POTATOES PAY

Make them pay by using the machines that really do the work—

**CUT, PLANT,
SPRAY,
DIG and
SORT**



There's nothing in potato machinery up to

ASPINWALL EQUIPMENT

Write for copy of our free book telling how to make money, growing potatoes.

ASPINWALL MFG. CO.
Sabin St., Jackson, Mich., U.S.A.
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Orange and Fig Orchards Pay Immense Profits

Here's a chance for the small investor, as well as the capitalist, to invest his capital or savings where it will earn big profits. Pay as little as \$5.00 down and an equal amount monthly and you become part owner in a Fig and Orange Growing Company owning 7,000 acres of the best land in the world for these fruits—land that will earn, when in full bearing orchards, from \$500 to \$1,000 an acre per year. Company will plant trees, cultivate the land and gather and market the fruit. You participate in these immense profits without leaving your present occupation or location. This is the opportunity presented to you in the purchase of the Acre-Bonds we are offering investors. No such opportunity ever offered before. If you come in now your investment should double, treble and quadruple in value from the advance of the land alone, besides you can share in profits almost beyond belief. The Acre-Bond absolutely guarantees you against loss. Land is located midway between Galveston and Houston in the heart of the fruit belt of the balmy South, where rainfall is abundant and irrigation unnecessary—that's why you can buy at one-tenth what such land is worth in irrigated districts. But you will have to pay more next year—twice as much more the year following. Now is the time to buy. Company composed of the leading business men and bankers of the South—conservative men who never back a failure or a fake. This is a business proposition that will appeal to every person seeking profitable investments. Handsome illustrated booklet explains entire plan, with facts and figures. We will send it free if you will write today.

THE AMERICAN LAND & MORTGAGE CO.
236 American Nat'l Bank Bldg.
HOUSTON, TEXAS

**You Will
Want to
Read This
Book
It's FREE**

**Figs and Oranges
in the
Galveston-Houston
District**

will be taken from the Wenatchee Lake, which will be made an immense storage reservoir through an immense siphon under the Columbia river to the lands. The settlers and land owners are organized, having a water-users' association incorporated under the state laws, and are a unit in working for irrigation, and it is believed that active work will soon be under way.

MILK RIVER PROJECT.

In the Dodson South Canal Unit of the government's Milk River irrigation project, there are about 11,000 acres of land involved in the farm units to be subdivided and classified. Of these lands about 6,500 acres are in the hands of actual settlers, about 1,900 acres are covered by entries which are held for cancellation, about 1,400 acres are covered by abandoned



P & O

Beet Implements


We are Pioneers in the Manufacture of Beet Plows, Seeders, Pullers and Cultivators, and have given special attention to the mechanical requirements of sugar beet culture. Our experts in all the beet growing sections have studied the subject thoroughly, and we offer the finest line of beet implements on the market. P. & O. Beet Tools are the simplest, the strongest, and the easiest running made, and they meet the exacting demands of all sections. These implements have every adjustment and convenience, and the Cultivators can be furnished with various attachments for every kind of work.

Send for our Special Catalog on P. & O. Beet Implements. Insist on getting P. & O. implements from your dealer, or write to us. A Beautifully Illustrated Pamphlet, and a P. & O. Catalog, will be mailed free. Write for Catalog No. G151

Parlin & Orendorff Co., Canton, Illinois.

Rider Agents Wanted

In each town to ride and exhibit sample 1910 bicycle. Write for Special Offer. **Finest Guaranteed 1910 Models \$10 to \$27** with Coaster-Brakes and Puncture-Proof tires. **1908 & 1909 Models \$7 to \$12** all of best makes. **100 Second-Hand Wheels** All makes and models, **\$3 to \$8** good as new. **Great FACTORY CLEARING SALE** We **Ship on Approval** without a cent deposit, pay the freight and allow **TEN DAY'S FREE TRIAL.** **Tires, coaster brake rear wheels, lamps, sundries, half usual prices.** Do not buy till you get our catalogs and offer. Write now. **MEAD CYCLE CO., Dept. Chicago**



A SATISFACTORY WATER SUPPLY

ALWAYS PAYS DIVIDENDS

A Humphryes' Hydraulic Ram will furnish you, when installed, with a permanent and automatic water supply. Why spend money on costly pumping plants and time, strength and expense in operating same, when a Hydraulic Ram will lift your water and deliver it with absolutely no expense. The Humphryes' Pneumatic System will supply your residence with water under pressure for all domestic purposes and give service heretofore obtainable only with an elevated tank or direct connection with municipal water works. Our New Catalog "Domestic Water Supplies" tells you all about the **HYDRAULIC RAM and PNEUMATIC SYSTEM** and will be mailed you upon request. **THE HUMPHRYES MFG. CO., MANSFIELD, OHIO**



DOUBLE POWER

\$1,000 Reward

for its equal. Wind power doubled. Two 14 ft. wheels work on same pinion; second wheel gives more power than first.

A Governor That Governs. In all winds. Develops 10 full h. p. in 20 mile wind. All power needed for farm, shop, irrigating, etc. Ask about our self-rolling, self-governed, single wheel pump—also Armsaver Husker. Ask for book 60 **DOUBLE POWER MILL CO., Appleton, Wis., U. S. A.**



Well Drilling Machinery

You can make big money making wells. This is one of the few lines of work that are not over crowded. The demand for wells is far greater than can be supplied by the machines now at work. Well Drillers command their own prices. We build the celebrated **HOWELL** line of Well Machinery, for making deep or shallow wells of all sizes, for all purposes and in all kinds of ground. Our machines are the most up-to-date on the market, contain all the latest improvements, are extremely strong and simple, do perfect work, are easily operated and are very **FAST WORKERS.** Write to-day for our free Catalog A. **R. R. HOWELL & CO., Minneapolis, Minn.**

The U. S. Government is Spending Millions of Dollars Annually to RECLAIM the WET Lands by DRAINING CONVERT the DRY Lands by IRRIGATING



For the "LAND'S SAKE!" when are you going to Drain or Irrigate that farm of yours? You don't need a surveyor. Get a **BOSTROM IMPROVED FARM LEVEL** and do the work yourself. Simplicity, Accuracy, Durability, Guaranteed. This Level is no makeshift. It has a Telescope, with Magnifying Lenses, enabling you to read the Target a quarter of a mile away; and is used and endorsed in every State in the Union. **SATISFACTION GUARANTEED OR YOUR MONEY BACK.** Shipped on receipt of price, \$15.00, or, if preferred, will ship C. O. D. subject to examination. Outfit includes Level, Tripod, Graduated Rod and Target, full instructions and a copy of Bostrom's Book "Soil Salvation" of twenty-five years experience in draining and irrigating. Send your order TODAY to—

BOSTROM - BRADY MANUFACTURING COMPANY, 1119 Pine Street, ST. LOUIS, MO.

I H C AUTO BUGGIES

For Business and Pleasure

YOU will find the I H C Auto Buggy the ideal vehicle for your use. It is the most simple car to operate, can be used by your wife or children with perfect safety—and when you want to make a hurried trip to town or to your neighbors—it is always ready.

The cost of oil and gasoline to operate an I H C Buggy is less than the cost of keeping one horse. It can be used when you would not dare to take a horse out and it never gets tired.

With an I H C Auto Buggy you can travel from one to twenty miles an hour over hills, through mud, snow—over any roads.

When you buy, get the car that has proved to be most—

Practical—Economical—Serviceable—

The one with the High Wheels and Solid Tires. You will find it the easiest riding and you will never have "tire troubles." A large wheel rolls over a bump or rut. A small wheel jumps over it. With solid tires you will never be delayed by punctures or blow-outs and you will save many dollars through not having to repair and replace worn-out tires. Solid tires are easiest on the roads. They do not flatten out and loosen dirt and gravel like inflated tires do.

There are many other advantages of the I H C Buggies that you ought to know about. They have full elliptic springs (36 in. long by 1½ in. wide) and a long base, insuring easy-riding qualities. The International Auto-Wagon has the same features of construction as the Auto Buggy and is a thoroughly reliable car for light delivery wagon purposes.

Ask your dealer to tell you all the facts, or, if you prefer write the International Harvester Company of America at nearest branch house for further information. Do it now—it's the first step toward obtaining the most satisfactory, money-saving conveyance for business or pleasure.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.
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claims, and 1,200 acres are vacant public lands. The Secretary of the Interior has approved the recommendation of the Reclamation Service, that the lands in the hands of actual settlers be held in farms of 160 acres each; this class includes deeded lands, lands entered prior to second form withdrawal, and lands entered subject to the provisions of the Reclamation act. The balance of the lands, including those held for cancellation, abandoned claims, and public lands, it is proposed to subdivide in farm units having an irrigable area of about 80 acres, and, wherever practicable, to include sufficient grazing land to make the total area of the unit 160 acres, but most of the public land farm units will be 80 acres each.

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Do you want everything printed in the newspaper, magazine and trade press of the United States and Canada on any particular subject?

Send us your order describing what you want us to clip, enclose \$3.00, and we will send you our service for one month, mailing you daily or weekly all clippings found on your topic.

We read and clip about 25,000 publications each month.

MANUFACTURERS can learn where there is a market for their goods, and how best to reach it.

BUSINESS MEN can obtain reliable tips which lead to business brought in on the follow-up plan.

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Send for our booklet.

1309-1312, 153 LaSalle St.



From 600 trees Miss Cowperthwaite harvested 450 boxes summer and fall apples; 3,000 boxes of winter varieties, which sold for \$1.35 per box, making a grand total of \$4,687.50. Photo taken October 9, 1909, Santa Fe District.

Land Opportunity in the Santa Fe District

Get your share of the profits on the present day high-cost of living.

Prices on food stuff are governed by the law of supply and demand.

Secure a 20-acre tract in the Santa Fe District and be a producer, and at the same time reduce your own expenses.

This land all within a short drive of New Mexico's beautifully situated capital city.

Proven by government statistics to be the finest climate in the world.

Two town sites on the land and two railroads crossing it.

Every tract within three miles of a town site.

A former governor of New Mexico says: "THE SANTA FE DISTRICT HAS MORE ADVANTAGES AND FEWER DRAWBACKS THAN ANY IRRIGATED SECTION IN AMERICA."

Send or call for full particulars.

National Mortgage and Bond Company
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When writing to advertisers please mention The Irrigation Age.

HERE IS A DEEP WELL INSTALLATION
FOR IRRIGATION
AMES DEEP WELL PUMP

TWENTY HORSE POWER ENGINE

12 INCH WELL 200 FEET DEEP

PUMP 150 FEET LONG

DELIVERS AT SURFACE 400 GALLONS PER MINUTE



WE MANUFACTURE **PUMPS** FOR EVERY SERVICE

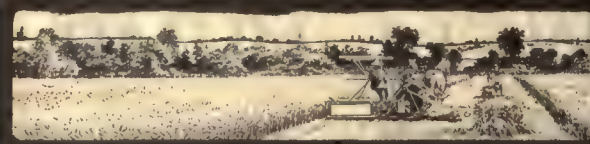
CUP LEATHERS in all sizes and shapes from one-half inch to thirty-six inches, made of the best

Oak Tanned California Leather

Write **A. T. AMES MANUFACTURING CO.** For Catalog
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PREPARE NOW



MAKE THE HARVEST CERTAIN

YOUR time and careful judgment cannot be used to better advantage than in preparing well in advance for the proper harvesting of your grain crops.

Take no chances of delays, with experimental harvesting machines. Don't risk the choice of one or two neighbors, because you must buy for many years' service as well as this year's harvesting.

It is necessary that you be prepared with efficient harvesting machines if you are to reap all the profit that your harvest should yield.

Right now is the time to ascertain whether or not you need a new harvesting machine—binder, mower, reaper, hay rake, tedder—it does not matter so much which machine you need, the principle is the same.

You should start today to look over your equipment—ascertain what you will need.

There are many points to be considered in selecting a harvesting machine. If it is a binder you need, you should have a machine that is efficient, dependable and durable; and then the machine should meet your particular requirements—and to do all this it is necessary that you take sufficient time to properly consider the selection of the new machines.

Buy wisely—safely—on the verdict of thousands of farmers of America and all over the world who have cut out the failures and choose from standard makes of the famous I H C Line of Machines.

**Champion McCormick Osborne
Deering Milwaukee Plano**

Why waste your valuable time—patience—labor, and sacrifice part of your crop this year and every year in experimenting with unsatisfactory machines? Others have taken all the experimental risk for you—if you act wisely now.

Don't wait until you must "buy in a hurry." That is not necessary, because an I H C Dealer is right near you and will, any day, show you just the

I H C machine adapted to your particular needs.

He will also take your reservation order for reliable binder twine on which you should take no risk this year. The late market may be flooded with inferior grades of experimental twine. It's important that you investigate these facts and your I H C Dealer has the details to show you—and the proof of quality on all machines and I H C brands of binder twine.

Then, too, remember that with the strongest and most reliable guarantee given on any machines in the world, you also have the satisfaction of knowing that I H C interchangeable parts are quickly at hand—through your I H C Dealer. No waits. No delays. No annoyance. Perfect workmanship and materials of highest quality are guaranteed by the experience of over half a century in I H C machines. Make your harvest certain.

We urge upon you the importance of deciding this matter now; because, if you put it off until a more convenient time, the chances are that you will never give the subject proper attention. You, no doubt, think there is plenty of time—but the harvest season will be upon you the first thing you know. Therefore, consider this harvesting machine question, now, while you have the time to give it proper study. Write for any information you may need to help you make a wise decision.

Take your choice of machines. The quality is the same in all—the best possible.

Don't experiment with binder twine, either. Get one of the seven perfectly dependable brands of twine and be sure. Choose Champion, McCormick, Osborne, Deering, Milwaukee, Plano or International—in Sisal, Standard, Manila and Pure Manila brands.

If it is not convenient to see an International dealer, write to International Harvester Company of America at nearest branch house for full information and the catalogue you want.

WESTERN BRANCH HOUSES: Denver, Colo.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

INTERNATIONAL HARVESTER COMPANY OF AMERICA

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I H C LINE

LOOK FOR THE I. H. C. TRADE MARK. IT IS A SEAL OF EXCELLENCE AND A GUARANTEE OF QUALITY

When writing to advertisers please mention The Irrigation Age.

Drilled Wells for Irrigation



MAKE EVERY WELL A FLOWING WELL

Flowing wells are not found in every locality, but they can be made to flow to their full capacity.

Every farm and every ranch should and can have their own water supply; a good well adds thousands of dollars to the value of a property.

The first item of expense is the only expense; a good well is inexhaustible and lasts for all time.

Big Profits in the Well Business

We want to send you our FREE book, "How to Make Money in the Well Business." It contains twenty pages from Sanderson's book, "Well Drilling, Methods and Cost," which is the only book published on the subject. It also describes our Advertising Plan which we are furnishing to our customers FREE.

Just drop us a postal today and we will show you how to handle a business in which there are REAL PROFITS.

ADDRESS (WELL DEPT.)

The Cyclone Drill Co.

ORRVILLE, OHIO

CHICAGO OFFICE:
419 Fisher Building

NEW YORK OFFICE:
1456 Hudson Terminal Building

Why Is It That No Man Ever Buys One

THE cheap little car, fresh from the factory, looks spick and span, and seems to promise its buyer a great quantity of enjoyment, but—
When that buyer gets his *next* car, he *does not* get one of those cheap little cars.

Why?

Not because he likes to spend more money.

But because he wants to *save* money.

• • •

Think that over.

It means something.

• • •

If a new car costs \$1500, and one year's repairs cost \$500, the price of that car is really \$2000.

If this \$2000 car is in the repair shop, getting fixed up, three days a month, its owner is losing one-tenth of its service, or \$200.

This car, therefore, stands its owner \$2,200 the first year, although it cost only \$1,500 to begin with.

• • •

And in using this cheap little car its owner never knows when something is going to break and leave him stranded miles from home.

Being a cheap car, it can't climb hills like a good car, it lacks the speed of a good car, it hasn't the size, style and beauty of a good car, and wherever the owner goes with it, it advertises him as a *cheap* buyer.

That's why no man ever buys one of these cheap little cars a *second* time.

• • •

If a car isn't worth buying a second time, it *isn't worth buying at first*.

And the buyer who recognizes that fact before he buys any car at all, saves himself much expense, much disappointment, and much annoyance.

• • •

If you are planning to buy a motor car, read every word of this advertisement.

• • •

We have made motor cars continuously since 1896. Mr. Winton made and sold the first gasoline car produced in America. He has made and sold more first class cars than any other single manufacturer. And we have on our books the names of men who have bought as many as six or eight of our cars. One buyer, Mr. L. R. Speare, president of the American Automobile Association, has owned and used 16 different cars of our manufacture.

It is because Winton cars are right in the first place—right in material, workmanship, power, style, beauty and cost—that once a man buys a Winton he will never be satisfied with any other make.

• • •

One reason why this is true is that the Winton car stands up under hard use with a smaller repair expense than any other car on the market.

Sworn testimony of 20 Winton owners (we send you their names and addresses upon application) show that 20 Winton cars travel 184,190 miles on \$142.43 repair expense.

That distance is more than seven times the distance around the earth at the equator.

And each car's average repair expense for 1000 miles is 77 cents.

That's a world's record that touches the pocket book of every automobile owner.

Compare that record with the expenses of the owners of other makes—right in your own neighborhood.

• • •

This wonderfully low expense record of Winton cars shows they are right in the first place—right in material, workmanship, quality, performance, right in everything that makes an automobile worth while.

• • •

And because they are right in the first place, Winton cars last longer than any other car on the market.

There are any number of Winton cars made as far back as 1896 still doing daily service in this country.

No other maker has a record to compare with the Winton record.

• • •

And because Winton cars stand up indefinitely, and run at less expense than other cars, it follows that a Winton car is always a wise purchase, no matter how old it may be.

For the quality is in the car itself, and it stays there.

If the quality isn't in the car in the first place, you can't put it there.

And that's why the buyer of a cheap little car never buys the same make a second time.

Because it depreciates so quickly that what little merit it originally possessed is soon gone, and the car is worthless.

• • •

We realize that there are many buyers who hesitate to put into a first car as much money as we get for our 1910 model—\$3000.

But we want the trade of these buyers just the same, because we know that once they become acquainted with Winton merit they will be the best salesmen for Winton cars we could get.

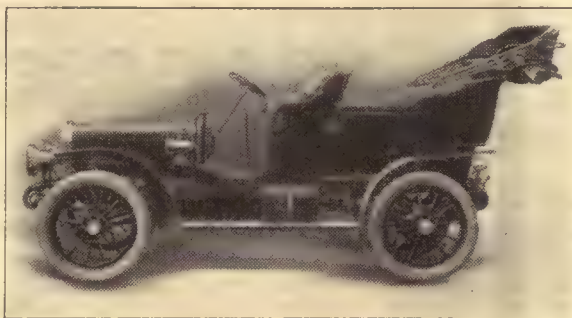
So we have devised a plan where the man who doesn't want to spend \$3000 can still get a Winton car, and be in the class of good buyers and satisfied owners.

• • •

This is the plan.

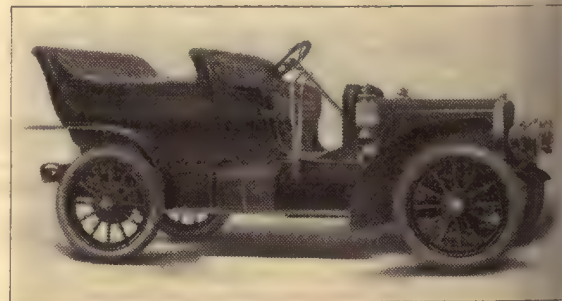
Some of our buyers want a new car every year—in order to have the very latest style of body, the latest thing in fancy trimming and the like.

These buyers turn over their used cars in part payment for new ones.



WINTON MODEL K.

Four-cylinder, 30 H. P. motor, 4-inch bore, 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Floating type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Three brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels running on roller bearings. 34x4-inch tires. Wheel base 102 inches. Gasoline tank 15 gallons. Five-passenger body. Original price \$2500. Bargain price, \$500 to \$800.



WINTON TYPE X-I-V.

Four-cylinder, 30 H. P. motor, 4½-inch bore, 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Semi-floating type rear axle. Forged steel front axle. Screw and nut steering gear. Four brakes. Pressed steel frame, Winton Twin springs. Best hickory wheels, running on ball bearings. 34x4-inch tires. Wheel base 104 inches. Gasoline tank 22 gallons. Five-passenger body. Original price \$2500. Bargain price \$700 to \$950.

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Remember this: If you ever buy a Winton car from the Motor Carriage Company, and it is not exactly as represented, we will give you your money back without bickering or delay.

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Look over the bargains offered on this page. Pick out one that appeals to you, and write us about it. This involves no obligation on your part whatever.

We will write you, describing the car in detail, tell you what it has in the way of top, glass front, speedometer, if any (some cars are sold without these equipments), and will make you a rock bottom price that will interest you.

And note this: You are not obligated in any way. We never ship a car to a prospect and try to force him to take it, when he has only asked for information.

The Winton Motor Carriage Company doesn't do business that way.

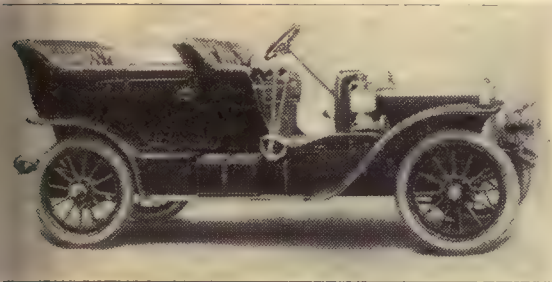
If after we have told you exactly what we have, you decide to look the car over, we will arrange for a demonstration before you put down a cent. Even then there is no obligation on your part. You needn't buy at all unless you are ready to buy and unless you are satisfied. And even if you do buy, remember we say: "Your money back if the Winton car is not as we have represented it."

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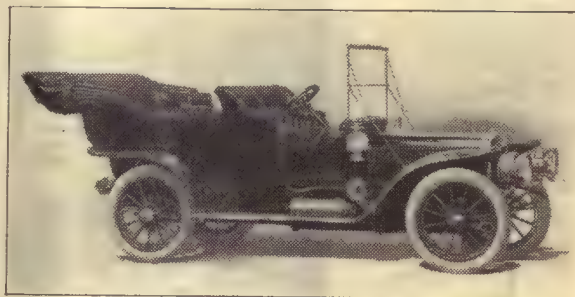
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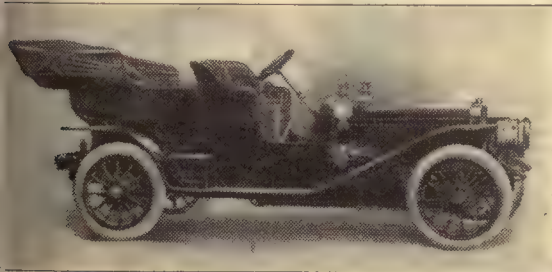
WINTON MODEL M.

Four-cylinder, 40 H. P. motor, 5-inch bore, 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Multiple disc clutch and four-speed selective-type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4½-inch tires. Wheel base 118 inches. Gasoline tank 22 gallons. Seven-passenger body. Original price \$3500. Bargain price \$1100 to \$1400.



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Self-cranking, six-cylinder, 48 H. P. motor, 4½-inch bore, 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magnets and storage battery. Hancock mechanical oiler. Multiple-disc clutch and three-speed selective-type transmission. Clutch and transmission run on ball bearings. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 36x4½-inch tires. Wheel base 120 inches. Gasoline tank 22 gallons. Seven-passenger body. Original price \$4500. Bargain price \$1600 to \$2000.



WINTON SEVENTEEN.

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Size of Discharge
Up to 6 inches

Fig. 813



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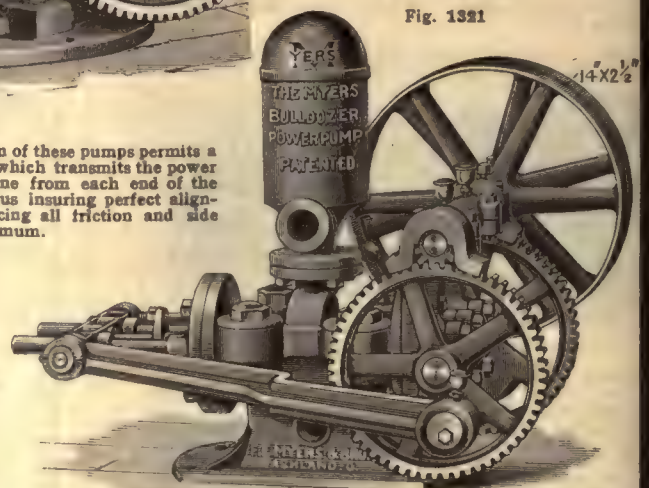
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Stroke
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Size of
Cylinders
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Size of
Discharge
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Capacities
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per Hour

Fig. 1321



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

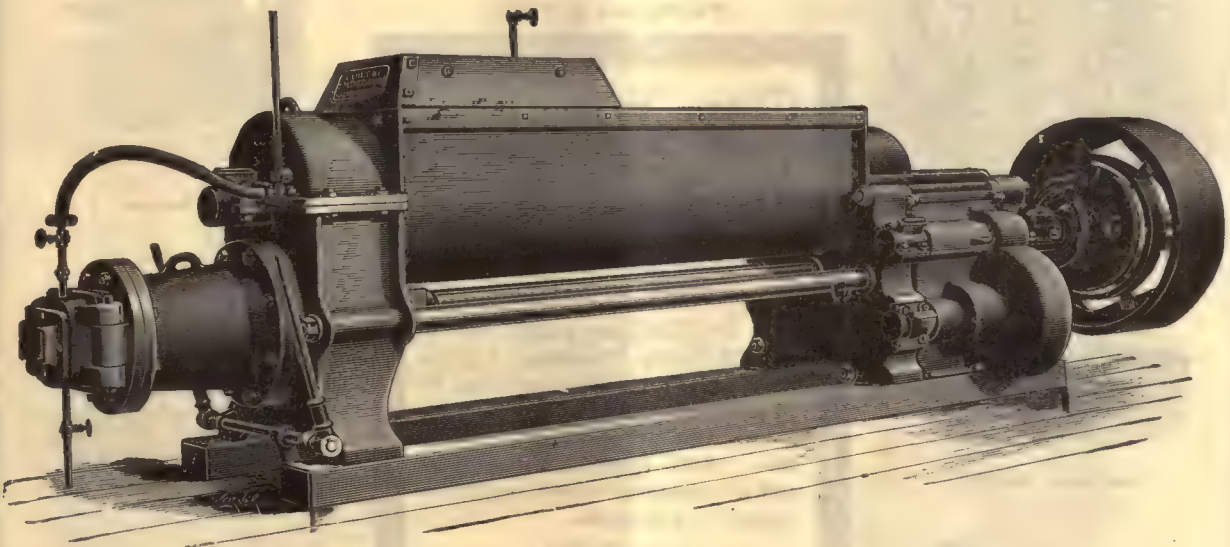
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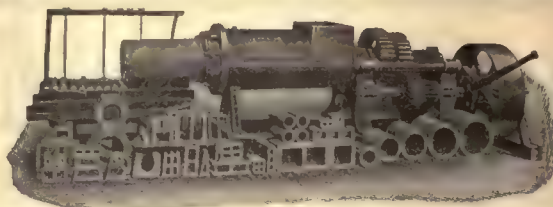


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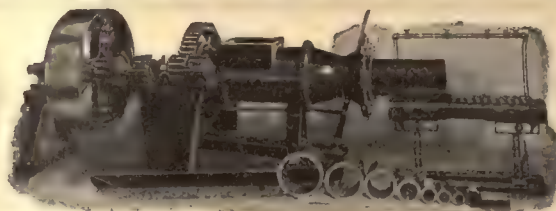
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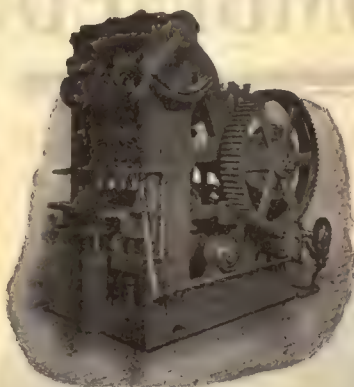
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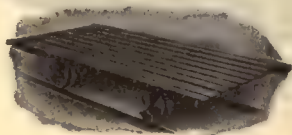
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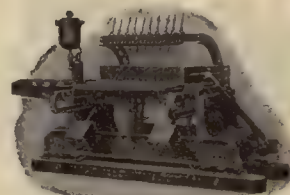
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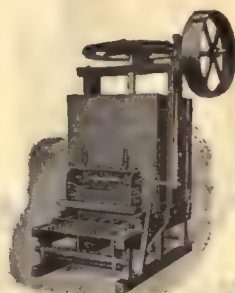
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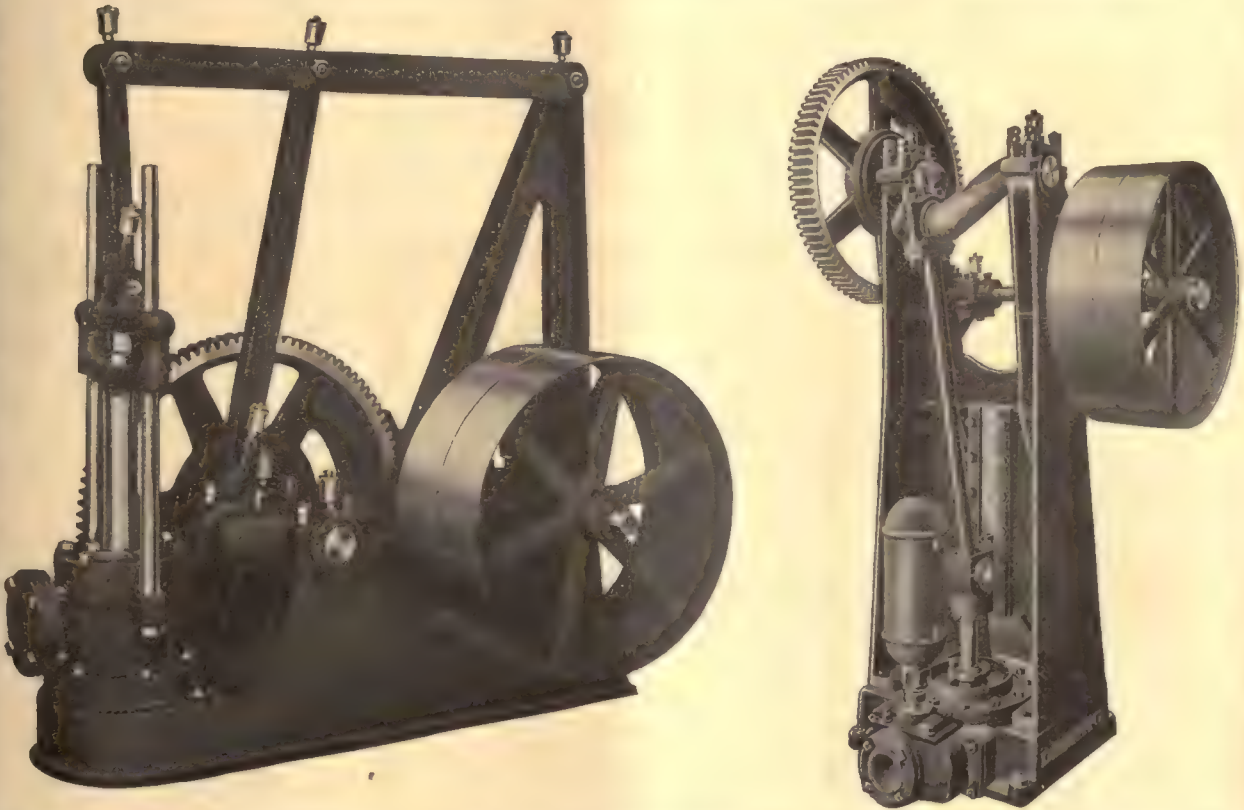
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VOL. XXV

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NO 7

CHICAGO, MAY, 1910

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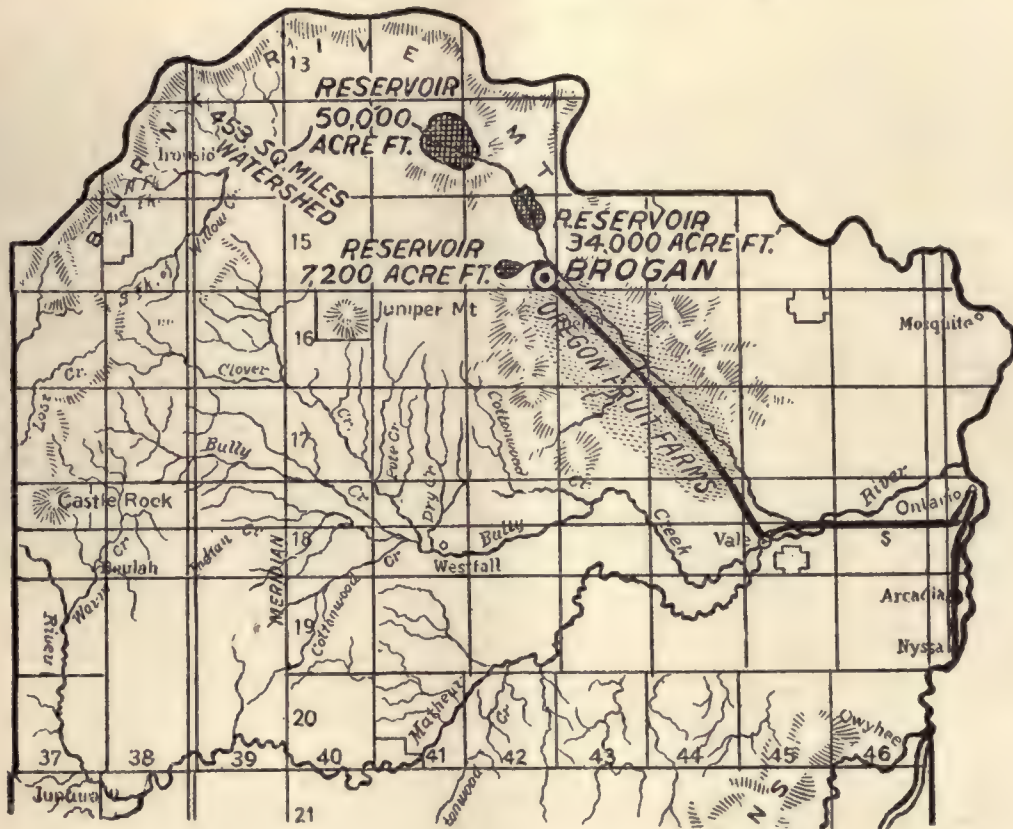
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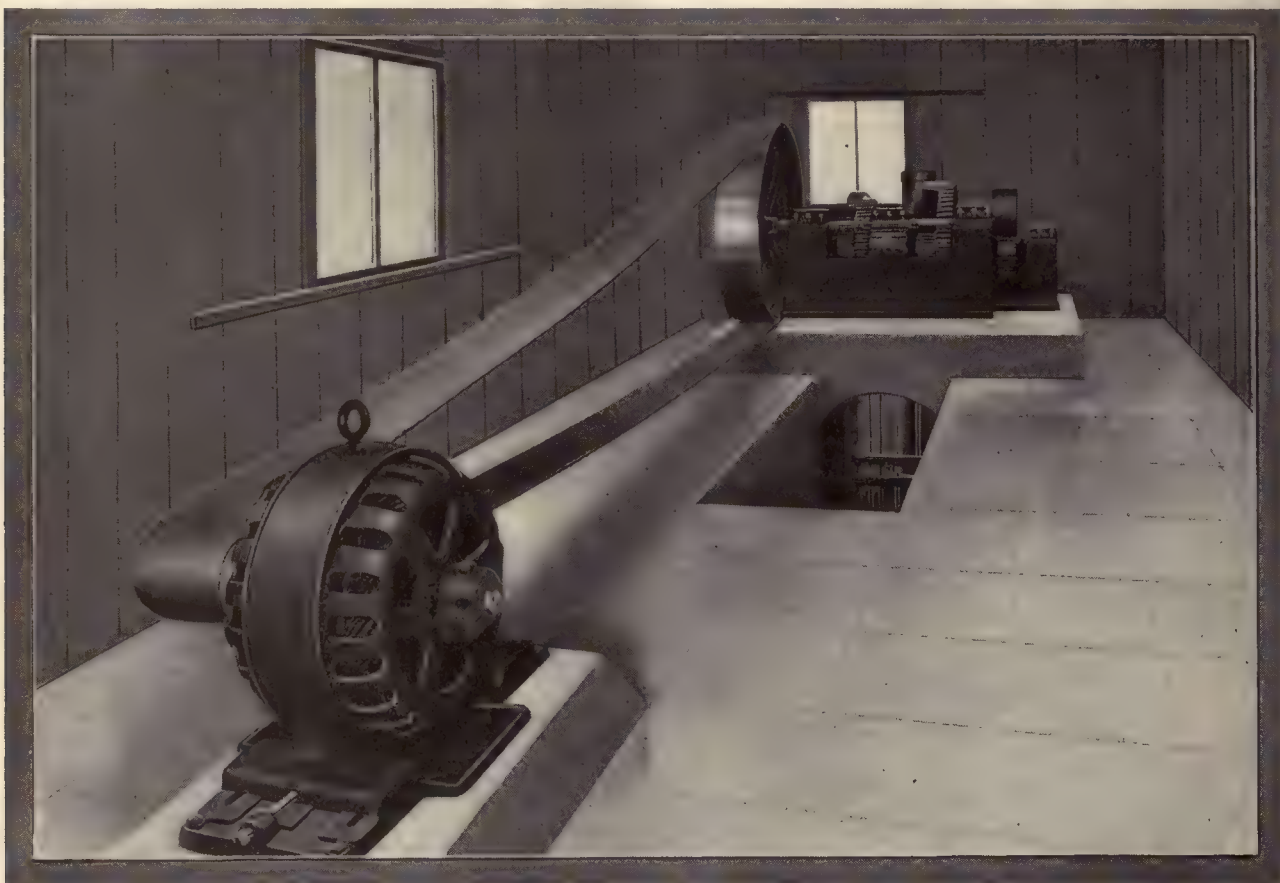
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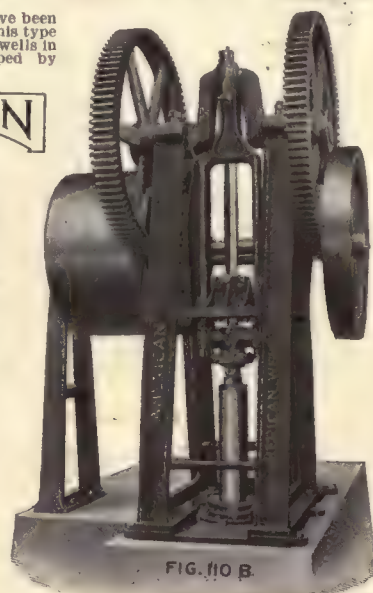
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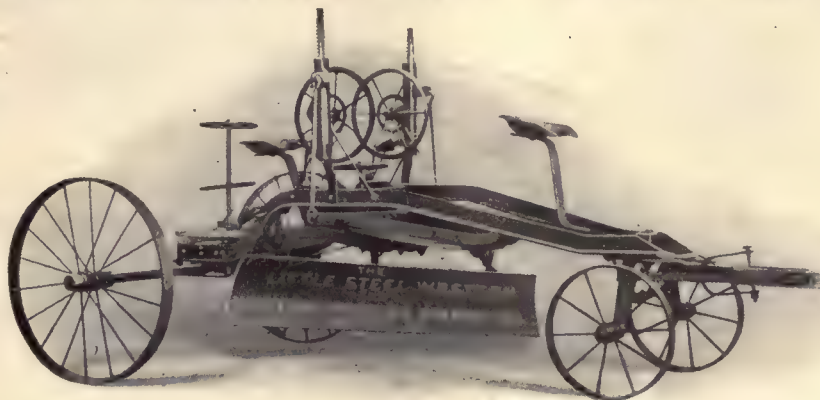
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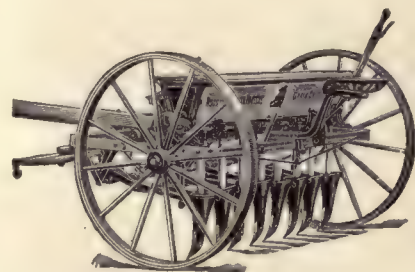
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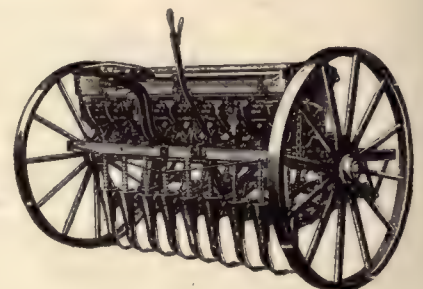
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Twenty-fifth Year

THE IRRIGATION AGE

VOL. XXV

CHICAGO, MAY, 1910.

No. 7

THE IRRIGATION AGE

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THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, - - CHICAGO

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price,
\$2.00. If ordered in connection with subscription, the price is \$1.50.

Notice.

The attention of our readers is called to the advertisement of a Wyoming ranch, appearing in another column and which, on account of the poor health of the owner, who is an elderly man, is offered at a price, considering the intrinsic value and excellent transportation facilities of the Laramie Valley, is remarkably cheap.

Irrigation Age Official Organ.

As will be seen by letter of announcement on another page of this issue, THE IRRIGATION AGE has been made the official organ of the National Irrigation Congress. Several elaborate editions of the AGE will be gotten out between now and the date of the Congress, fully explaining the commercial interests of Pueblo and the entire Arkansas Valley, of which Pueblo is the business center.

Series of Special Articles on Texas.

Following the announcement in these columns last month, the IRRIGATION AGE has sent a representative to the Lower Rio Grande Valley in Texas, to collect data concerning irrigation in that state. Owing to the fact that there has been much rapid development in the central and western states, the AGE has neglected the great and growing irrigation section in the lower Rio Grande valley. To correct this condition the well known author and writer, Dr. Brophy of Chicago, will write a series of articles to appear in future issues of the AGE. Dr. Brophy may be depended upon to furnish matter that will inform readers of the wonderful resources of this section and will prove of interest to the eastern subscribers to this journal.

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Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 25 years old and is the pioneer publication of its class in the world.

Final Proof Rendered Easier.

An item of more than ordinary importance has lately appeared in the country press concerning the old ruling of the Department of the Interior to the effect that every irrigable acre of desert entry must be watered before patent is issued. This ruling has been overthrown by a decision in the case of the United States vs. Alonzo B. Cole, arising in the Durango, Colorado, district. The decision is of unusual importance, because of its bearing upon lands throughout that section.

Assistant Secretary Pierce holds that where the settler shows cultivation and irrigation of one-eighth of the land, ownership of water right and delivery of water in canals to the land, final proof will be accepted. The ruling is, in effect, that where final proof submitted upon a desert entry shows that the entryman has cultivated and irrigated at least one-eighth of the land, and has constructed ditches, owns a sufficient water right, has brought water to the land and is prepared to turn water upon the entire tract when it shall have been cleared and prepared for cultivation, he would not then be required to show further that water has actually been distributed over all the irrigable land under his entry. Heretofore it has been the practice of the department and all of the land offices in the various states to require entrymen, in offering final proof, to show that every irrigable acre within the tract has been watered.

This decision of Assistant Secretary Pierce is in line with many other good moves inaugurated under the Ballinger administration of the Interior Department, and the IRRIGATION AGE takes pleasure in calling the attention of its many readers to the fact that Mr. Ballinger is studying carefully to make the burden of the colonist as light as possible and yet keep within safe legal limits.

The story of the New Santa Fe Trail Run **R. H. Faxon**, and the article in the April issue of this journal on Cimarron and the Santa Fe Trail were written by Mr. R. H. Faxon, Secretary of the Board of Control of the Eighteenth National Irrigation Congress. Mr. Faxon is also President of the New Santa Fe Trail Association, and was the active force in the organization of the Arkansas Valley Commercial Association, which has recently been accomplished, and is becoming known as the live wire of the Arkansas Valley.

Irrigation Congress. Word reaches the AGE from its Pueblo office that splendid work is being performed at the headquarters in that city, in the way of exploiting the meeting to be held in September. The local board of control has the details well in hand, and judging from present indications the Eighteenth Congress will be the best attended meeting in the history of the organization. The board of control is composed of men of high standing in the community, who fully comprehend the task before them and are capable, in their organization and as individuals, to perform it.

Carey Act Projects Listed. Many of our readers will, no doubt, be pleased at the opportunity offered in this issue to see, in connection with Mr. Bohm's serial article on the "Carey Act," a list of all projects having lands open to entry or purchase at this date, or under which lands can now be filed upon under an escrow agreement. This is the first complete list of this kind ever published.

Although the publication of the list this month is not in strict accord with the text of the work, the AGE, at Mr. Bohm's request, is anticipating its appearance by fully a month to give those who may contemplate filing, or who are desirous of making a personal inspection of the projects, reliable data at the time when it will be of most value to them.

The greatest movement toward western lands in the states in which most of the projects are located, usually begins soon after June 1st, the date when the low trans-continental summer tourist rates go into effect on all western railroads, and when climatic conditions permit inspection of lands to the best advantage.

A copy of this list with the valuable information contained as to acreage, location and cost of water rights should be included with every tourist's "travel literature." Much valuable information can be secured by correspondence with the various state officials, and with the companies listed.

Ballinger on Stand Refutes Charges. After all of the fuss and trouble stirred up by the former forester and his lieutenants, through serious charges against Secretary Ballinger, it was reasonable to expect that they would be able to submit proof to substantiate at least some of their statements.

It has been very gratifying to the friends of Secretary Ballinger to note that in no single instance have his accusers submitted conclusive evidence either of wrong-doing or improper motives in his official acts. While the decision of the Committee appointed to investigate the charges has not been rendered, it is fair to presume from the evidence submitted that the finding will be in favor of the Secretary. Because of the campaign of abuse and vilification

directed against the secretary, this fact cannot be too strongly exploited by his friends.

It is well known to those who have studied the situation, and followed the movements of Pinchot and his friends for the past eight or ten years, that he has used his position and contact with the daily press of the country, to besmirch the reputation of those who were not in sympathy with his views. All of the time that money was being paid to the press bureaus for the exploitation of Pinchotism and the so-called Conservation movement, he was continuously criticising individuals who opposed him, particularly the Secretary of the Interior. When the history of this case has been written in full, the public, generally, will then learn that jealousy on the part of Ex-Secretary Garfield and Pinchot led them beyond the bounds of reason and fairness in an effort to defame a reputable cabinet officer.

Record of Seventeenth National Congress.

Handsomely bound, and containing information most comprehensive in scope, the report of the proceedings of the Seventeenth National Irrigation Congress, comprising 545 pages, is now being distributed to delegates and officials of this gathering.

The reproduction of papers upon numerous phases of irrigation, render it extremely valuable from a technical standpoint, and the verbatim reports of the business transacted at the general sessions and at the Committee meetings make it a valuable contribution to the history of Irrigation congresses.

It contains a list of officers and committees of the Seventeenth and Eighteenth Congresses, a copy of the "Official Call" and a complete stenographic report of the proceedings at all sessions of the Congress, and is embellished with numerous cuts.

A valuable feature of the report is the "Appendix," containing an account of special meetings of Lumbermen and Forestry officials, including all papers read at these gatherings, President Taft's address upon "Conservation of National Resources," delivered at Spokane, September 28, 1909, the report on Irrigation Demonstrations held at the Model Irrigation Exposition Farm a few miles from Spokane, and a minutely classified index.

More Conservative Lines.

Under Forester Graves, the U. S. Forestry Bureau is being conducted along more conservative lines than ever before. He appears to crave no personal adulations either from co-laborers or from the public and it is evident he will not curry popular favor to the detriment of his work as the head of a federal bureau.

Mr. Graves gives promise of capability as a public servant, and it may be predicted that he will not be influenced too greatly by the wishes and suggestions of his predecessor.

Three New Features for Age Readers.

Attention of our readers is directed to three classified divisions of news features to be found in this issue. The publications of the Department of Agriculture are many of them classics in the literature of their various fields of investigation and research, covering a variety of subjects in almost every phase of human endeavor. Their value is so generally recognized that in presenting excerpts, adapted to the wants of our readers, of the publications listed by the department, from

month to month, with information as to the means of procuring them, we feel that we are publishing data of real value.

The "United States Reclamation Service Record" will contain all items of interest relating to the United States Reclamation Service, appearing in the Official Monthly Record of that department. These items will appear under this classification from month to month, or as its interest to the public may require. Much of this information has heretofore been presented under the caption "Reclamation Notes," but hereafter the field will be more thoroughly covered and the interest of a large part of the public more efficiently served if segregated in this manner.

The "Decisions of the Public Land Office and the Department of the Interior," being issued at irregular intervals, their appearance in each succeeding issue cannot be guaranteed. No attempt will be made to reproduce all decisions; the publication will be confined to those of interest to the land-seeking public generally, and except in cases of more than usual interest, the syllabus only will be presented, together with date of the decision and title of the case upon which resting. Many of the decisions bear upon lands under government reclamation projects, and for that reason may be reproduced under the caption "U. S. Reclamation Service Record."

In the present issue, we have carried our records in the three divisions back to the beginning of the present fiscal year, or to the date of publication of the last previous volume dealing with the subjects. This presentation will prove, we trust, of especial value to Engineers, Attorneys and Land Agencies.

Farm Land Congress Organizes Exposition.

The overture to a drama of national importance was rendered at Chicago on April 18th, when the "Conference Committee" of the Farm Land Congress of last November—still fresh in the public mind—by unanimous resolve decreed that the movement inaugurated at that time should become a dynamic factor in the unfolding of national activities, and created a permanent organization, to be known as the "National Farm Land Congress." By the reappointment of the officers whose energy and acumen were responsible for the phenomenal success of the last gathering, a glorious future for this movement is assured. Under their regime the varying and divergent forces evolved from the present movement toward the country's farm lands will be marshaled under one controlling and directing influence.

For years the greatest obstacle in the path of the aspiring "homeseeker"—the man intelligent enough to "sense" the importance of impending events and forceful enough to desire to grasp the opportunities afforded—has been the lack of an agency for centering information bearing upon the country's varied agricultural resources—their disadvantages as well as their merits—whether intrinsic or relative. That this statement is founded upon truth will be conceded by all who are familiar with present-day conditions, and this utterance will pass muster without, in any sense, reflecting upon any of the forms of government, state and railroad activities which must in the future remain as a mainspring in knowledge of this character.

Under the ultimate plan of the Conference Committee it is proposed to make all the data, heretofore supplied piecemeal, available as a whole, to institute a "clearing house" of authentic information, to act when called upon as a "consulting bureau," where all who desire to find the

conditions best suited to their peculiar bias or individual circumstances may gain the service and counsel of experts.

The keynote of the movement and its "declaration of independence" of selfish influences is contained in the resolution unanimously adopted by the committee, asserting, in effect, that "no congress" managed by private interests, as a money-making enterprise, and to advance personal or business ends, can be of permanent usefulness in the great work of inculcating the "back to the land" spirit, or accelerating the movement, and that, in fact, it is absolutely dangerous in that the interests of honest homeseekers cannot be guarded under such management from the gross misrepresentations of interested persons and unreliable land men."

The support of the Exposition, as advocated by the Farm Land Congress, is practically assured from the outset, by the support of the newly organized "Exposition Association of Seventeen Irrigated States," which was represented at the conference meeting by Mr. C. J. Sinsel, the president of the organization.

A complete report of this gathering appears in another column and the announcement of the personnel of the Executive Committee will be made by President Farnsworth.

Western States Form Exposition Association.

Upon the stage of western development "One event doth tread upon another's heels so fast they follow," and historians of the future may marvel at the process whereby a land of infinitely varying natural conditions, approximating in area the whole of civilized Europe, was, in the span of an average lifetime, redeemed from savagery to the highest type of civilization. A bit of moralizing may be pardoned in one who has observed, for a quarter of a century, the changes wrought west of the 97th meridian, and who can say, like the historian of old, "All of this I saw and much of it I was." The student of economy and sociology, familiar with the climatic conditions of the west, must see in the evidences of superabundant energy a striking parallel to the creative energy displayed by the peoples of the pre-Christian era, inhabiting the arid regions of Eastern Asia and Northern Africa.

The interesting feature of this modern world-movement is to be found in the evidences of access of vitality and energy, which even a few years of residence in the rarefied atmosphere of the western plateau region, with its accompaniment of life-awakening sunshine, will impart with the certainty of fate to the most debilitated offspring of the humid east. Physiologically these changes are well understood and easily explained, but this is not a medical brochure.

These reflections are forced upon one in reminiscent mood as the result of the announcement of the latest step taken by the people of the arid west to attract to their bountifully dowered land the one element lacking to round out the scheme of things into a perfect whole—the virile manhood whose presence in greater numbers is essential to the moral and physical well being of many a sparsely settled community. The lusty infant of the west has never been chary of advertising its resources; individuals, communities, even states have spent of their accumulated hoard toward this end, but heretofore almost entirely in an effort to bring the dissatisfied easterner to the west, to see the evidences where they grow, and in this endeavor they have been assisted by the railroads in a manner most laudable. This process, for varying rea

sons—principally the apathy of the older districts—did not always bring the desired results, and many of the sections interested sought to “carry the war into Africa” by placing exhibits at various expositions held in the east.

Difficulties of management and the injustice of contributing to the profits of privately managed exhibitions caused much dissatisfaction here also, and gave rise to organized protest on one occasion.

The movement which had its origin at Chicago last December crystallized into definite proportions at Salt Lake City on April 4th, and a permanent organization was effected whose object is to carry on the propaganda in the east vigorously, and free from entangling alliances with private interests, and to this end has wisely declared its intention of co-operating in the matter of education and exhibition with the “National Farm Land Congress.”

Delegates to the Exposition Association, as well as Messrs. Farnsworth and Walsh, of the Farm Land Congress, are to be congratulated upon this happy union of effort. The AGE has consistently advocated this course and has reason to feel well pleased with the issue.

PENROSE, COLORADO.

(Correspondence.)

A year ago the writer came to Penrose, Colo., which was mostly mesa then. A leading irrigationist had called attention to the fact that the Beaver Land and Irrigation Company's project located around Penrose was constructed on ideal lines for the conservation of water.

That project is now about completed and the town of Penrose is growing literally by leaps and bounds. Three brick business blocks are now completed, large general store, two lumber yards, and every line of business that goes to make a good live town is now represented.

This community is located thirteen miles from Canon City, the great fruit district of the Arkansas Valley. Fruit lands that are worth \$1,000 an acre can still be bought at Penrose at \$125 to \$200 an acre.

The most distinctive feature of the Beaver Land and Irrigation Company's property is the fact that all the waters are conserved. From the immense dam and reservoir nine miles away, draining 130 square miles of area on the southwest slope of Pike's Peak, the water is conducted, not through open ditches, but through concrete pipes to every ten-acre tract. There is, therefore, no loss by seepage or evaporation.

This will be one of the novel and unusual sights that will be seen by the visitors to the Irrigation Congress in Pueblo, Sept. 26-30. Pueblo is located twenty miles east.

Fruit trees are now about two years old at Penrose. Cherry trees will bear this year.

The Santa Fe Trail runners made a special stop on their Kansas-Colorado run, April 21, to look at one of the newest of the bright, promising irrigation towns of the Valley of Content.

FOUNTAIN COLORADO PROJECT.

Word has reached us that the work of enlarging the Fountain canal, which supplies a large area of land in the Fountain Valley, Colorado, has been completed and all land owners will secure sufficient water this season. New laterals have been constructed and water is now being delivered to tracts where trees are being planted. The superintendent of the IRRIGATION AGE ranch informs us that he has prepared the ground and planted 500 cherry, 30 apple, 10 peach and 10 plum trees. He is preparing to set out 1,000 dewberry plants.

Mr. W. C. Johnston, president of the Fountain Land Irrigation Company, who visited Chicago recently, stated that the reservoirs are all full and that much work has been done in the way of improving the entire project.

EIGHTEENTH IRRIGATION CONGRESS.

By R. H. Faxon, Director of Publicity.

It is a peculiarly appropriate and equally significant fact that the Eighteenth National Irrigation Congress, Pueblo, September 26-30, 1910, will be held in the city named for the tribe of Indians that first practiced the ancient art of irrigation in this country—the Pueblo tribe.

These Indians inhabited portions of what are now the territories of New Mexico and Arizona, as well as Southern Colorado. Their descendants were still cultivating the land and practicing irrigation when the Spanish came to these parts centuries ago, with the sword in the one hand and the cross in the other. Traces of the work of this tribe are still to be found in the great southwest, and the marvel of modern engineering is the precision with which they constructed their ditches and their works.

The Mormons, in Utah, were the first English-speaking people to entertain the practice of irrigation in anything like a systematic manner in the West, and their successes are a matter of history. Southern California was the next English-speaking section of the West to put water on the land, and it partly grew from the labors of the placer miners, who utilized the water with which they washed their ore to grow crops upon the lands.

Colorado, in its northern section, was one of the first portions of the west to lend its attention to this ancient art, and its success has been marked. Every problem in irrigation—and there are many—has been solved in the Fort Morgan, Fort Collins, Boulder and Greeley districts and on the North Platte and Cache la Poudre.

It has been estimated that there are 40,000,000 acres in the west susceptible of irrigation, of which the twenty-five government projects now complete or in process of construction will comprise more than 3,000,000 acres. Private projects have already taken care of more than 10,000,000 acres, and other private projects, now in contemplation or under way, will have an additional acreage of 5,000,000. Added to this must be enumerated proposed government projects, thirteen in all, ready for funds to construct them, having an acreage of 3,250,000.

There are many private projects in the country of enormous proportions, but the largest actually under way is the DeWeese project at Pueblo, which will take care of 300,000 acres, and on which work is now beginning. There is a chain of related projects on the Snake River in Idaho of larger acreage, but not a single project like the DeWeese at Pueblo; and another of large acreage, the Horseheaven in Washington, which is now being organized, will plan to put 600,000 acres under water. Projects promoted by private capital and having 100,000 acres are by no means unusual, and two of these are in the Pueblo country.

One of the most gratifying things of the year, and a result that may be directly traced to the influence of the National Irrigation Congress, is the act of Congress approved February 25, 1910, amending the census act in several particulars, but more especially providing for a complete census of private irrigation projects. This contemplates the acreage, the crops, the capital invested, and will furnish accurate and official figures for the benefit of not only irrigationists and agriculturists, but engineers, capitalists and publicity experts. This inquiry will be made a portion of the regular census taken, to begin April 15. The unusual effort put forth by the friends of the Eighteenth National Irrigation Congress and its officials is directly responsible for this marked progress and result.

An irrigation publicist has recently figured, in a careful and conservative way, that a census today would show fully 250,000 farms in the United States under ditches, watering more than 15,000,000 acres of lands. The state of Colorado, within which the Eighteenth Congress will be held September 26-30 next, leads all other states, having 3,500,000 acres under water and 20,000 miles of canals and laterals. California has the largest number of irrigators, while the state of Washington has the greatest percentage in the number of irrigators.

Send \$2.50 for the Irrigation Age 1 year, and cloth bound copy of the Primer of Irrigation

IRRIGATION AGE

Official Publication of Board of Control

Eighteenth National Irrigation Congress

A perusal of the following letter will explain how and why this journal has been made the Official Organ.

"SAVE THE FORESTS, STORE THE FLOODS, RECLAIM THE DESERTS, MAKE HOMES ON THE LAND"



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EIGHTEENTH NATIONAL IRRIGATION CONGRESS

SEPTEMBER 26 TO 30, 1910

PUEBLO, COLORADO March 31st, 1910.

My Dear Mr. Anderson:-

The Board of Control of the Eighteenth National Irrigation Congress, Pueblo, Colorado, September 26th-30th, 1910, realizes the fact that IRRIGATION AGE is the foremost publication in irrigation and development work in the country, and one of the leading journals in the West in every particular. The Board of Control appreciates the work of IRRIGATION AGE in the past twenty-five years, and the great service it has rendered in the cause of irrigation. The publication itself, and you as an individual, who helped organize the National Irrigation Congress, and served it so ably as secretary, certainly have a fixed status with respect to the Congress, which has now entered such a large and important field in this country.

The Board of Control realizes that in years past a great attention has been attracted to the congress for that year by means of unusual efforts made by your publication, and particularly by some special editions of IRRIGATION AGE. These have forced attention upon the Congress, its purpose and what it expected to do by reason of the high character of these editions, and the splendid enthusiasm with which you entered into the work.

It is, therefore, with pleasure, that the Board of Control recognizes IRRIGATION AGE as the official publication, and expresses the hope that it will see fit this year, as in former years, to put out one or more special editions, inviting attention to the work of the National Irrigation Congress, and to the Eighteenth sessions to be held in the city of Pueblo, September 26-30, 1910.

Very respectfully yours,

(SIGNED) P. J. DUGAN, CHAIRMAN.

(SIGNED) R. H. FAXON, SECRETARY.

BOARD OF CONTROL

EIGHTEENTH NATIONAL IRRIGATION CONGRESS

Mr. D. H. Anderson,
Publisher, IRRIGATION AGE,
Chicago, Illinois.

SANTA FE OFFICIALS BECOMING REAL FARMERS.

A number of officers, heads of departments and subordinate employes of the Santa Fe Railway, during the past year, have acquired a tract of land in the foothill district of Fresno County, California, all to be planted to oranges. The location is ideal, with the Sierra Nevada range as a background, facing a beautiful valley covered with vineyards and orchards.

About three thousand trees were set out last spring, and the coming season from seven to eight thousand more will be planted. Orange trees come into bearing in four and five years, and with reasonable care are prolific bearers and yield big returns.

The foothill districts of Tulare and Fresno counties are becoming famous for their choice oranges, due to favorable soil and climatic conditions. The fruit comes to the market very early and commands good prices. Fair average returns are more than \$300 per acre. In many in-



GEO. T. NICHOLSON,
Vice-President the Santa Fe Railway.

stances profits are greater. In the immediate vicinity of the Santa Fe colony returns the past season have been as much as \$560 per acre net, and \$2,000 per acre refused for the fee simple title to groves seven and eight years old.

The purpose of the colony is not speculative, but to establish homes. In a few years each place will be far enough advanced to yield a good income and prove very desirable insurance. The colony consists of 520 acres, divided into twenty-acre tracts; the owners installing their own pumping plant, using electric power, and have put in eight miles of concrete pipe to distribute the water for irrigation. Electric power is very cheap and will be available for other purposes.

Among the members of the colony are Mr. George T. Nicholson, Vice-President; Mr. C. L. Seagraves, General Colonization Agent; Mr. George T. Gunnip, General Agent—all of the Santa Fe, Chicago, and a number of their friends. The plan was conceived and worked out by Mr. Seagraves, and the successful launching of this colony will induce others who are occupying salaried positions to do likewise.

The slogan of "back to the soil" is attracting people in all walks of life, and when far-sighted, hustling western railroad officials see the wisdom of making land investments, it is a good lead to follow. For men officially connected with large transportation lines probably see farther into the future than the average layman. They are in close touch with development all over the west, study the economic situation and investigate the supply and demand, and through such analysis determine the exact situation.

There is a very manifest interest among salaried men in the higher occupations to acquire small holdings in sections which have natural advantages of climate, the

variety of crops which may be grown, social, religious and educational advantages, and what competence may be reasonably expected, and whether it will provide enough to maintain the same standard of living they have been accustomed to. After a few years a better standard may be maintained and in more delightful surroundings.

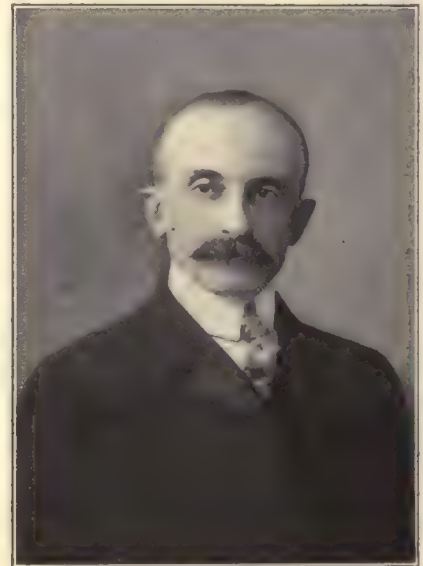
The attendant advantages of these movements mean the extension of trolley and steam lines, with all the comforts and conveniences of urban life. The average twenty-acre man, with only half of his land in oranges, enjoys more comforts and advantages than the average salaried man of four thousand dollars or more.

The mountains with their thousands of acres of beautiful timber, lakes, streams and rugged scenery, make an ideal country for a summer outing, while they who prefer the seashore may reach it conveniently in five or six hours.

UNIQUE IRRIGATION EXPERIMENT.

George F. Brill, who has a ranch near Deer Park, Wash., is experimenting with a new system of irrigation. His plan is to run lines of porous tiling between the rows of trees in his orchard, and thus to irrigate from beneath the surface. The idea of the new system came to him some years ago when in the east he had occasion to drain off a swamp. He put in tiling to make it more effective. Mr. Brill is endeavoring to reverse this plan in his system here, his object being to lead the water into the land.

The trees in his orchard are 28 feet apart, so that two lines of tiling are necessary between the rows. This system, if successful, will facilitate the cultivation of the soil and will do away with a great deal of labor and waste of water. The tiling is being manufactured on the ground by a



C. L. SEAGRAVES,
General Colonization Agent the Santa Fe Railway.

special process. It is figured that it will cost between \$100 and \$150 per acre to install the system.

The plant furnishing the water is being constructed with double 6-inch walls filled with sawdust, covered on the outside with siding and painted, sealed on the inside with ship-lap, making it frostproof. The building rests on a concrete foundation. Below is the gasoline engine which pumps the water into the two galvanized tanks. The plant when complete will cost between \$1,100 and \$1,500.

If the plan is successful the owner will construct a concrete tank of sufficient capacity to irrigate the entire ranch of 160 acres. There is a deposit of fine gravel on the place suited to the purpose of making the porous tiling used in the underground system of irrigation.

—FOR SALE— WYOMING RANCH.

327 acres in Albany County, 16 miles from Laramie, in the beautiful Laramie Valley; $2\frac{1}{2}$ miles from railroad station.

Every acre of land irrigable by gravity. Never-failing spring for domestic and stock water on the premises.

House and barn now erected. A-1 potato land.

Will sell as a whole or in two parcels. Reason for selling, poor health of owner.

For prices and terms address "OLANDER,"

Care IRRIGATION AGE,
CHICAGO, ILL.

TO PERPETUATE FARM LAND CONGRESS

Conference Committee Holds Enthusiastic Meeting —Permanent Organization Effected—
Exposition Planned.

April 18th preliminary steps were taken at a largely attended meeting of the Conference Committee, of the National Farm Land Congress at the Hotel La Salle for the second annual meeting of the congress.

The Conference Committee was provided for before the adjournment of the first annual meeting last November, and it was composed of the representatives of the governors of many states, the heads of transportation companies, various newspapers, the advisory committees and others.

For the purpose of carrying out its objects, the Conference Committee provided for an executive committee of thirty-five members, to be appointed by the president, Mr. Farnsworth, and to be put back of the movement, to-wit: Representative state officials, publishers of important newspapers, managers of news associations, heads of important railroad companies and others. This executive committee is given entire charge of the business of the congress and will arrange all things relating to its scope and the plans for carrying out the same.

The authority for all action taken was given by a resolution adopted at the first annual National Farm Land Congress, wherein the chairman was instructed to appoint a conference committee to meet in Chicago upon call of the chairman to consult together and to formulate plans to continue the work. The conference committee of seventy-five members to be composed of the old advisory committee, and of the Commissioner of Public Lands of the United States, the governor of each state or his personal representative, the commissioner of lands of each state or other state officer concerned with the lands, immigration or agriculture of the state, the presidents of the important railroad companies, the presidents of the national farmers' organizations, the presidents of all news associations in the United States, the officials of the Chicago Association of Commerce and such others as the chairman of the advisory committee might deem it advisable to appoint.

The general objects of the congress being, by the widest possible publicity, through the press, to promote American farm home building, to bring into permanent productive use all lands available for profitable farming purposes, and to increase, among the people, the spirit tending to remove the crowded populations from the cities to settlement upon the land, two plans were suggested to the executive committee which will take charge of the second congress:

First: An educational congress, without exposition features, to be participated in by delegates appointed by the states and territories, business men's organizations and other organizations not financially interested in the sale of lands; the only expense of the congress to be that of providing the necessary hall for its assembly, entertainment features and the incidental expense of an organization, and publicity office to be open throughout the year.

Second: The same as the first, and added, a special exposition feature, composed wholly of small, compact, illustrative exhibits, put in by states, territories or counties alone; the exhibits to be of products of the lands of the respective states, and of soil and other maps showing in detail, by localities, the lands of the state, prices of same, cost of production, average net profits to the farmer and anything which would enlighten the homeseeker as to his profits and environment. Each state to be limited to the same maximum amount of space for its display. The "speaking congress" might be limited to a week, or such time as deemed advisable, while the exposition might consume three or four weeks, or as long as might be useful, each state maintaining its own lecturer at its own exhibit at all times. The central idea being to encourage the homeseeker; every article in a state's exhibit to be accompanied by placards and maps which definitely and specifi-

cally answer all the queries naturally in the homeseeker's mind as to cost of land, production cost, profits, how to acquire the lands, etc.

Rules—A committee should formulate for the congress a set of rules to be followed; and if the exposition feature is adopted, rules should be devised for both congress and exposition governing all participants and preventing, so far as may be possible, the perversion of the congress and exposition from its fundamental purpose and insuring the presentation of reliable data to homeseekers.

Press Committee—The presidents of all the news associations and press bureaus or their representatives should constitute a press committee to serve from year to year, to secure the utmost publicity, both during the sessions of the congress and throughout the year, all those things tending to promote farm home building.

Finance Committee—A finance committee should be appointed to arrange for all moneys necessary for the use of the congress and its permanent office.

The Conference Committee unanimously adopted the report of the subcommittee on officers and organization, as follows:

Your Committee on Officers and Organization reports the following to this Conference Committee for adoption, to-wit:

1. We recommend the adoption of the name "The National Farm Land Congress" as the permanent name of this body.

2. We recommend the election of the following officers, to hold office until their successors are elected: Don Farnsworth, President; Governor R. S. Vessey of South Dakota, Vice-President; C. A. Walsh, Secretary; George E. Roberts, President of the Bank of Commerce, Treasurer.

3. We recommend that the general business of the congress, when not in session, shall be in the hands of an executive committee, composed of thirty-five members, ten of whom shall constitute a quorum, this committee to be appointed by President Farnsworth at as early a date as possible, and the officers of the congress shall be ex-officio members of the committee. At least ten members of the committee shall be selected from as many different states with due reference to their geographical position. Any member of the Executive Committee who shall be unable to attend any meeting of the committee shall have power to appoint a substitute to act for him at such meeting.

(Signed) SAMUEL DUNLAP, Chairman.

Attest: C. A. WALSH, Secretary.

There was much discussion by the members of the Conference Committee during both forenoon and afternoon meetings, covering not only the matter of organization immediately in hand, but a wide range of subjects which it is important for the newly selected officers and Executive Committee to consider. The general sentiment seemed to be that no congress managed by private interests as a money-making enterprise and to advance personal or business ends can be of permanent usefulness in the great work of inculcating the "back to the land" spirit of accelerating the movement; and, further, that it in fact is absolutely dangerous in that the interests of honest homeseekers cannot be absolutely guarded under such management from the gross misrepresentations of private and interested persons and unreliable land men.

In this connection, C. J. Sinsel of Boise, Idaho, who is president of the United Exposition Association of Irrigated States representing seventeen irrigated states, read the resolutions adopted at Chicago last fall, and reaffirmed at a late meeting of the association at Salt Lake City, expressing the intent of the association to make no further exhibits or participate in any privately managed exposition, which, they were convinced, could in no way give

general publicity to home building opportunities nor command the support of all the newspapers—at least of the city where the exposition was held.

Besides the members of the Advisory Committee (a complete roster of which was published in the AGE of December, 1909), there were present at the meeting the following:

Edward F. Bohm, irrigation expert and personal representative of Governor Judson A. Harmon of Ohio.

Judge A. E. Chamberlain, Superintendent of South Dakota Farmers' Institute and personally representing Governor Vessey of that state.

State Engineer Samuel H. Lea of South Dakota.

Samuel C. Dunlap, Chairman of the Georgia Board of Immigration and personal proxy of Governor Brown of that state.

Hugh B. Farrell of Tennessee, holding proxy of Commissioner of Agriculture Thompson of that state.

Ex-Governor W. S. Jennings of Florida, proxy for Governor Gilchrist.

R. P. Teele, Special Agent of the United States Government.

Captain John F. Merry, General Immigration Agent Illinois Central Railway.

C. M. Fleischer, United States Industrial and Agricultural Exposition Company.

L. J. Brinker, General Immigration Agent of the Northern Pacific Railroad.

L. L. Lawrence, General Immigration Agent New Orleans, Mobile & Chicago Railroad.

Nat Martin of Arkansas, representing State Land Commissioner Coffman.

R. E. Grace of Kentucky, representing Governor Willson.

G. T. Werdine of Nadeau, Mich.



1—Don Farnsworth, President The National Farm Land Congress.
2—Geo. E. Roberts, President of the Bank of Commerce; Treasurer The National Farm Land Congress.
3—C. A. Walsh, Secretary The National Farm Land Congress.
4—Gov. K. S. Vessey, Vice-President The National Farm Land Congress.

James M. Hurst, cashier of the National Bank of the Republic of Chicago.

D. H. Anderson, Editor, IRRIGATION AGE.

Huntley Russell, State Land Commissioner of Michigan and representing Governor Warner.

A. D. Campbell, State Commissioner of Immigration of Wisconsin.

C. J. Sinsel, President of the United Exposition Association of Irrigated States, representing seventeen reclamation states.

Hon. Cyrus Bradley, representing the Commercial Club of Spokane, Wash.

Walter D. Moody, General Manager of the Chicago Association of Commerce.

Mr. Abbott, representing the Chicago, Burlington & Quincy Railway.

Senator R. E. Dowdell of South Dakota.

G. B. Chapman of Chicago.

H. W. Moury of Rhode Island.

A. M. Axelson, of Colorado.

Van B. Burton, of Indiana.

G. S. Brainard, of Minnesota.

Mrs. Janet M. Cole, of South Dakota.

ARID AGRICULTURE

BY

B. C. BUFFUM, M. S.

Manager of the Wyoming Plant and Seed Breeding Company, Worland, Former Professor of Agriculture in the University of Wyoming and the Colorado Agricultural College, and Director of the Wyoming Agricultural Experiment Station.

PLOWING.

The plow has evolved from a crude war-club, which was put to use for tilling the soil and afterward became the first letter of the alphabet.

"Stirring and mixing the soil is the fundamental labor of agriculture." (Roberts.) Plowing is the foundation upon which the structure of farming is built. It is the matter of first concern to the farmer. Plowing seems to be a simple and easy process, but both the science of the why and the art of the how, are deep subjects. The character of his plowing displays the knowledge of the dry farmer and underlies his success.

With hardly an exception the recommendation to the dry farmer is to plow deep. Ordinarily this means to plow as deep as possible which will generally be from seven to ten inches. This first commandment for dry farming is probably the one most often broken. It is not always possible to plow deep. The soil may be hard. The farmer more often does not have sufficient power to pull his plow. A common condition on western farms is small horses, few of them—and lack of that care which gets the most out of a horse. Sometimes the right kind of plows are not at hand or are not kept in best condition.

The first reason we plow deep is to make a large enough reservoir to absorb and hold the moisture. Our soils have been pounded down for centuries by the patter of rains and the feet of animals. They are too compact and have perhaps never been wet to a depth of more than a few inches. When in tith some of these soils will absorb over 40 per cent of their weight of water. If they contain from 8 per cent to 20 per cent of moisture they are in condition to support growing crops. A crop of oats at Laramie did not wilt for some days when the soil contained as little as 3 per cent of moisture.

How the storage capacity of a soil may be increased by deep plowing may be illustrated by a few figures. A soil weighing one ton per cubic yard, weighs approximately 1,613 tons per acre taken one foot deep. If such a soil will absorb and hold 20 per cent moisture and is plowed six inches deep, it will take up 161.3 tons of moisture per acre. A rainfall of 1.4 inches will supply this amount of moisture and fill up our six-inch reservoir. If the ground is plowed only three inches deep, and the sub-soil is hard, it would not be able to store a rainfall of more than seven-tenths of an inch and should more water fall at one time it will be lost and may wash the soil away with it. If plowed nine inches deep and put in good condition, such a soil reservoir would absorb and hold over two inches of rainfall at one time. A soil already containing a considerable water would be filled up with less rain, and deep plowing would be still more important.

Deep plowing is usually good plowing in that it grinds up and pulverizes the soil. Soils that are plowed deep come more rapidly into good tith. Fining the soil particles releases and makes available plant food. It lets in warmth and air and gives better chance for the activity of chemical agents and bacteria.

The larger part of soluble plant food becomes available in the surface soil. Plant roots pass through it easily and here they send out their feeders to make use of the foods ready for them. If four-inches of the surface soil is kept stirred for mulch the difference between plowing seven inches deep and eight inches deep equals twenty-five per cent in the area of the surface soil upon which the roots feed.

Where the soils are light and winds drift them, shallow plowing may result in all the top soil, down to the sole of the furrow being blown away. Deep plowing, on the contrary, throws up heavier and rougher furrows, and tends to anchor the soil in place. Plowing deep, therefore, both prevents washing and drifting.

Where soils are heavy, it often happens that only an inch or two of the surface is in condition for the growth of plants. Turning this surface soil under and covering it deeply with cold, untamed and unproductive clay, may prevent raising a good crop for longer time than it is desirable to wait. This seldom occurs in dry farming, for the summer fallow will tend to put the soil into tith before the first crop is planted. Some soils may be so shallow that it is not well to plow them deep. Where irrigation is practiced in some of our drier regions where the soil is very poor in vegetable matter, merely discing two or three inches of the surface often gives a better first crop of grain than plowing. Such soils must be irrigated often and carefully because the soil may wash and the area for storage of moisture is so small that it dries out quickly. Generally a soil that is suitable for dry farming is one which may be plowed deeply.

Subsoiling is done by using a digger which follows the plow and tears up a few inches of the furrow sole or by means of a mole plow which is run underneath the furrow and lifts and breaks up the subsoil to the depth of fifteen inches or eighteen inches. It is expensive to prepare ground by subsoiling and is not recommended for general practice. Our rainfall is so small that so large a reservoir is not needed for storage of moisture and where irrigation is practiced there seems no advantage from filling so much loose soil with water at one time. There are places where subsoiling is advisable, and it often proves profitable for root crops or preparation of land for tree planting.

The second time the soil is turned, plow about two inches shallower than the first plowing. This is to avoid turning up the undecomposed sod. In our dry climate it ordinarily takes more than one year to incorporate any vegetable matter plowed under, with the soil. Crops plowed under when green, or well rotted manure, will become humus much more rapidly than will dried-out materials. Sometimes it is best to back-set the land by turning the furrows the same direction as the first plowing. If the land is in good condition, cross-plowing will do more to pulverize and make a good seed bed. It is economy to make the lands as long as possible to avoid much turning at the corners and tramping. If a soil is plowed year after year at the same depth the sole of the furrow becomes packed and hardened by the smoothing action of the plow bottom, and by the tramping of the horses. This may bring good results sometimes when irrigation is practiced, but in dry farming, doing alternate plowings at different depths, tends to break up the furrow sole and allow movement of moisture to and from the subsoil.

Good plowing is the kind that gives the best results in the crop. What good plowing is, depends on conditions, but the work should be well done. Poor work always leaves its mark and the mark is always a minus sign when its result reaches the pocketbook. Good plowing may be defined as the smooth, even furrow so turned that the soil moved, sets more or less on edge with few and small air spaces underneath, and with the furrow slice crushed and pulverized as much as possible. There should be no skips and the cut and cover method is absent. To do good plowing the furrow should be cut no wider than the plow-share, and to be on the safe side good farmers cut an inch or two narrower than the lays properly shaped. A factor in good plowing is to do the work when the soil is in the right condition. This will differ on every farm. Heavy clay soils must not be plowed too wet. There is little danger of working our more sandy soils when wet. Western soils may be plowed when quite dry and left in condition to absorb the first rains or melting snow. The lime in them insures flocculation and there is little danger of dry puddling.

Late fall or early spring plowing is practiced to absorb moisture. In some parts of the West, where the rainfall comes mainly in the winter season, the soils may get so hard and dry that until the rains come it is not possible to plow them in the fall. Where the rainfall comes in the spring and summer the soils are usually in such condition that they may be plowed in the fall, though they are sometimes very dry. A comparatively new practice is to disc the sod or stubble immediately after a crop is harvested to save the moisture and keep the soils in condition to be fall plowed. The spring season is usually the most busy one and especially is this so at high altitudes where the spring work must be done in a very short time. Having the plowing out of the way by doing it in the fall, enables the farmer to get his crop in

(Continued on page 333.)

Irrigation of Alfalfa

By SAMUEL FORTIER,
Chief of Irrigation Investigations, Office of Experiment Stations,
U. S. Department of Agriculture.

THE FURROW METHOD.

Alfalfa, native meadows, and grain are most commonly irrigated by one of the methods previously described

in one of the orange orchards of Southern California.

The alfalfa grown in the Yakima Valley in Washington is practically all irrigated by means of furrows. The grading is usually done by buck scrapers, while a long, rectangular drag similar to the one shown in a previous issue removes most of the surface inequalities that remain after the surface has been leveled roughly by the scraper. The float is made of two 2 by 6-inch timbers about 20 feet long, held in position by crosspieces of the same size, 6 feet long.

The common practice is to run the furrows across the entire width or length of a field, and in consequence their length varies from 20 rods or less in small fields to 80 rods in large fields. As a rule, the furrows are too long. Farmers object to cutting up a field by head ditches, but in a climate like that of the Yakima Valley in midsummer, by far the most essential element in plant production is water, and all other considerations should give place to it. It has been shown* that water is rarely distributed evenly in furrow irrigation and that much is lost by deep percolation. To increase the length of a furrow beyond 660 feet, or one-eighth mile, not only increases the loss, but renders a uniform distribution more difficult to secure. Except in rare cases, this distance should be regarded as to the limit for the length of furrows. In light, sandy soils, having a porous gravel stratum beneath, the length may well be reduced to 250 feet.

Figure 17 shows the manner of dividing an alfalfa field for furrow irrigation at Kennewick, Wash. Lumber head flumes, either 8 by 8 inches or 6 by 6 inches, are placed along the upper boundary of each strip, and the direction of the flow in both flumes and furrows is indicated by arrows. Auger holes are bored through one side of the flume flush with

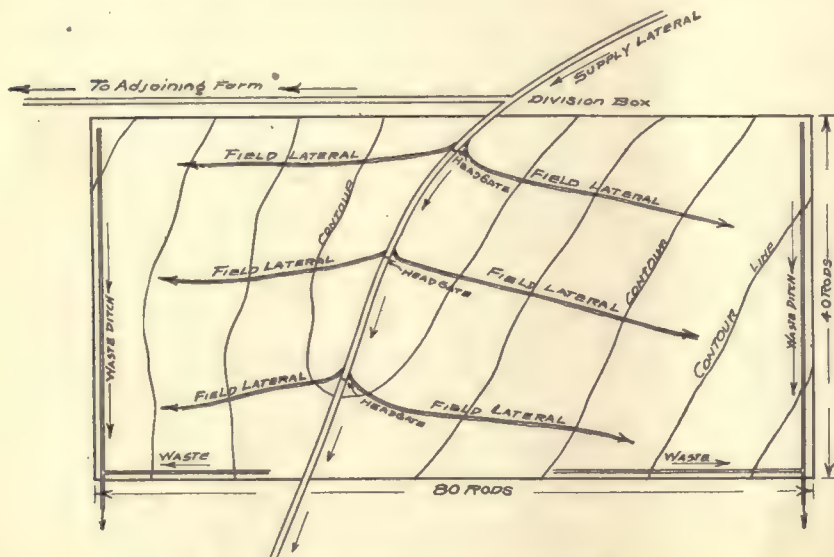


Fig. 14. Plat Showing laterals and headgates.

rather than by the furrow method, which is the usual method of irrigating orchards, gardens, root crops and vegetables. The irrigating of alfalfa from furrows is at present confined to the Yakima Valley, Washington, to portions of the Snake River Valley in Southern Idaho, and to comparatively small areas in other states. In the localities named the soil is a fine clay loam which runs together, puddles when wet, and bakes and cracks when dry. Flooding the surfaces by any of the customary methods tends to puddle the top layer of soil, which becomes quite hard when the moisture is evaporated. The puddling and baking processes injure alfalfa, and it was with the object of keeping as much as possible of the surface dry that furrows were introduced. When a small stream is permitted to run in the bottom of a furrow for several hours the soil beneath and for some distance on each side

boundary of each strip, and the direction of the flow in both flumes and furrows is indicated by arrows. Auger holes are bored through one side of the flume flush with

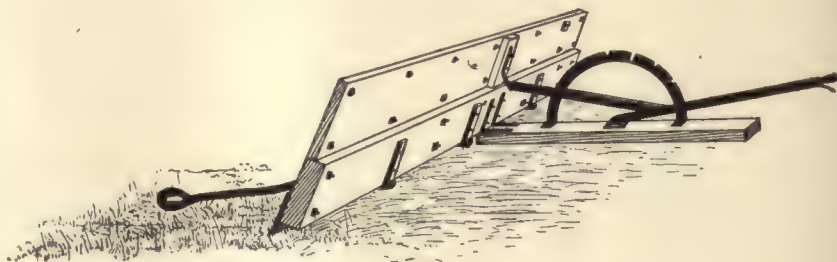


Fig. 16.—Buck scraper.

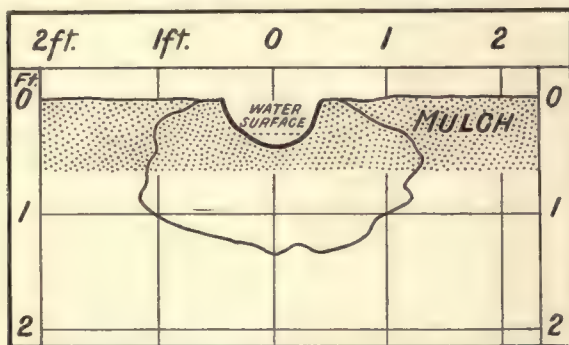


Fig. 15.—Outlines of percolation from furrow 5 inches deep, in seven hours.

becomes wet, while the surface may remain nearly dry. This is shown in Fig. 15, which gives the area wetted from a furrow 5 inches deep in seven hours as determined

the bottom at points where water is to be delivered to the heads of furrows. A short piece of lath revolving on a nail controls the flow from each opening. On steep grades a cleat on the bottom of the inside of the flume nailed on crosswise just below each opening will dam back the water and increase the discharge.

When flumes are considered too costly the water is distributed among the furrows through wooden spouts set in the bank of an ordinary earthen ditch (Fig. 18). These head ditches when in operation are divided into a series of level spaces by means of drop boxes which hold the surface of the water at the desired elevation. The spacing of these drop boxes depends on the grade of the head ditch and their cost averages about \$2.50 each. Spouts are made usually by nailing together four lath. There is a special lath on the market somewhat heavier than the ordinary one used for plastering buildings, being 0.5 inch thick, 2 inches wide, and 3 feet long. Four of these when nailed together cost about 3.5 cents and each spout in place costs about 6.5 cents. Assuming that they are spaced 4 feet apart, the spouts for a square tract of 10 acres would cost \$10.73, or slightly more than \$1 per acre.

*U. S. Dept. Agr., Office Expt. Stas. Bul. 203.

The cost of an ordinary head ditch, with four drops or check boxes, would be about \$15 for the same tract, or \$2.50 per acre for both, exclusive of grading, smoothing and leveling. Tin tubes, 0.5 inch in diameter, one to each furrow, have sometimes been used instead of the wooden tubes. When set 0.5 inch below the water surface each tube discharges about 0.1 miner's inch which is about right for a slope of 3 per cent. The length of the tin tubes is governed by the size of the ditch bank. The tubes are set while the water is in the ditch and are kept at the same level between check boxes. The cost of tin tubes 2 feet long is about \$3 per hundred. In many places neither flumes nor tubes are used. Water is taken through cuts in the ditch bank and divided among the furrows as evenly as possible by directing it with the shovel. This practice reduces the cost of preparing the land for irrigation, but it increases the cost of applying water, and does not secure an even distribution among the furrows.

Furrows in alfalfa fields are most commonly made by the use of a marker, or furrowing sled. Sleds with more than two runners are sometimes used,

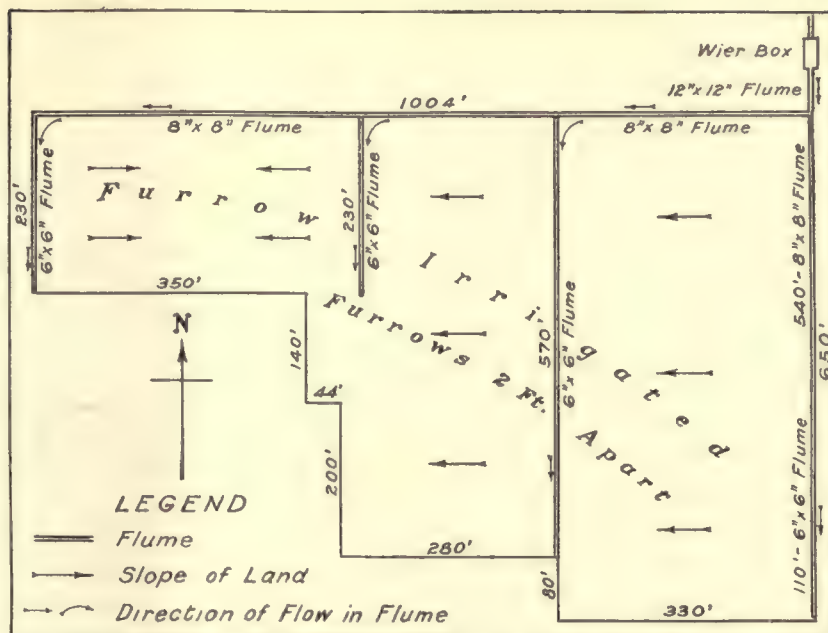


Fig. 17.—Showing tract prepared for furrow irrigation.

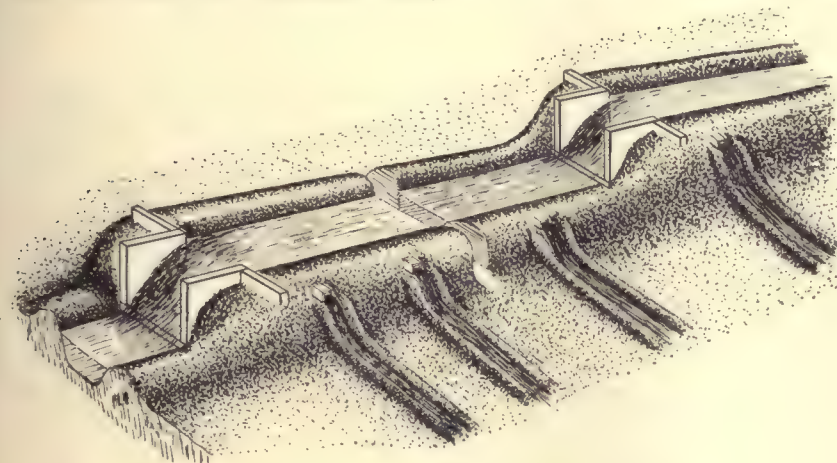


Fig. 18.—Manner of placing tubes in ditch bank for furrow irrigation.

reducing the time required for furrowing, but not producing quite so satisfactory furrows, since an obstruction under one of the outside runners will lift all but the other outside runner out of the ground and leave obstructions in the furrows, which, if not removed, will cause the flooding of the surface. Sometimes a marker is put on the sled to indicate the place for the next furrow.

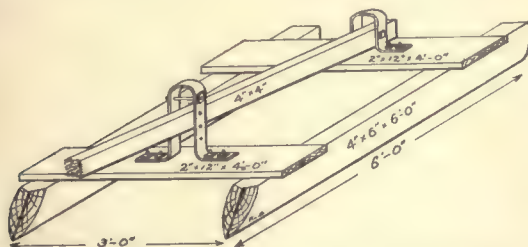


Fig. 19.—Furrower used on experiment farm, Riverton, Wyo.

For the irrigation of most of the crops grown in the vicinity of Twin Falls, Idaho, the feed ditches are laid out across the field as nearly parallel as possible on a grade of 2 to 6 inches to 100 feet and 300 to 500 feet apart. Furrows are made in the direction of the greatest slope and approximately at right angles to the feed ditches. Starting at the upper end, a wooden check is

inserted in the ditch at the end of each fall of 12 inches. Thus, if the ditch has a fall of 4 inches to 100 feet the checks are placed 300 feet apart. Each check box is provided with a removable flash-board, which, when in place, backs the water to the next check above and at the same time permits the surplus water to flow over its top to supply the checks below (Fig. 20). Lath tubes 16 to 24 inches long are inserted in the lower ditch bank about 3 inches below the water level formed by the flash-boards when in place. These tubes are put in while the check is full of water in order that all of each set may be on the same level and that water may be had for puddling. The flow from each tube may be divided among several furrows. Ordinarily a 40-acre farm will require about 30 check boxes and 1,800 tubes. Nearly one-half the tubes ought to be 24 inches long to insert near the check boxes where the bank is heaviest, the remainder may be 16 inches long. The check box shown in the sketch (Fig. 20) calls for 17 b. m. feet

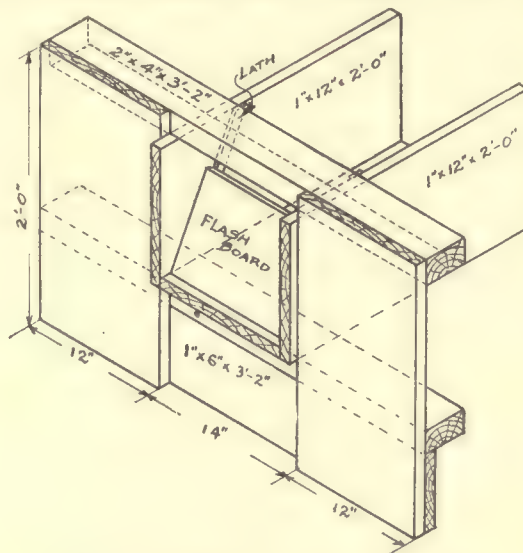


Fig. 20.—Check box for furrow irrigation.

of lumber, but a serviceable box can be made out of old packing boxes.

Some of the advantages of this method over ordinary furrow irrigation are: A constant head over the inlets of each set of tubes while the surplus passes down the field ditch; the opportunity to use one or all or any combination of checks at the same time, as it is possible to regulate the head and consequently the discharge by raising or lowering the flashboard; and the automatic character of the water distribution while irrigating.

No fixed rule can be given as to the proper spacing of the furrows or the time water should run in each. In heavy retentive soils the furrows may be 2 to 2.5 inches deep and only 16 inches apart, while in more open soils the furrows may be 48 inches apart.

The amount of water which should flow in each furrow depends on the character of the soil and the slope. It is a common practice in the Yakima Valley to space the furrows 18 to 24 inches apart when the seeding is done, but as the plants grow their roots soon penetrate several feet into the soil and alternate furrows are then abandoned. If the tract contains 10, 20 or 30 acres the furrows run all the way across, if the slope will allow it. Water is frequently run a quarter of a mile in the small furrows. In furrows 660 to 1,320 feet long in sandy loam, the water has to be kept running continuously for about two days, and consequently there is usually much waste due to deep percolation. In distrib-



Fig. 21.—Building a supply ditch.

uting water in furrows it is a good plan to follow the practice of the irrigators of the orange belt in Southern California, who turn into each furrow, until the furrows are wet, three or four times as much water as will be permitted to remain, and then reduce the flow.

MAKING MORE POTATOES.

For a good many years the general farmer has contented himself with occasionally going over his potato plants with a bucket and a stick in an attempt to eradicate entirely the destructive potato beetle or "bug." In a way, this has answered the purpose, since the plants were saved from being entirely consumed by the hordes of insect pests that continually swarmed up from nowhere, but of course it was impossible to rid each plant of all the bugs that infested it. Some of the eggs were sure to remain and hatch.

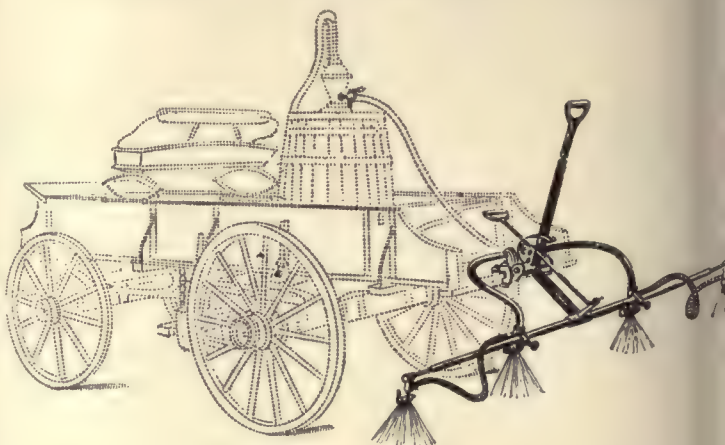
Then there were the many varied plant diseases to which the tubers were subjected and a few years ago no methods were available to effectually control them, since no systematic study had been given to this branch of agriculture.

Realizing that more scientific methods should be adopted to successfully combat these different pests, the New York Experiment Station at Geneva made some very interesting and careful experiments in recent years, the results of which have lately been published in bulletin form.

Their research revealed that frequent sprayings during the dry seasons of the year effected much better plant conditions and a proportionately increased potato crop. Volunteer experiments carried out by interested farmers under the written directions of the Station gave very interesting results.

Out of eleven volunteer experiments, there was shown an average gain per acre, due to spraying, of 66¼ bushels. The average net cost of spraying per acre was 84 cents and the average price of potatoes at digging time was 60 cents per bushel. A little mental arithmetic makes it self-evident that it pays to spray.

The observations made in these experiments have convinced all the researchers that it is unwise to neglect spraying in dry seasons. Even when there is no blight, five or six sprayings should be made during the season. In dry weather the wounding of the leaves by bugs, flea beetles and other insects is more injurious than in wet weather. Unless regular spraying is practiced, the application of poison for bugs is likely to be neglected. Flea beetles flourish best in dry weather, and it is an estab-



Machine Used to Spray Potatoes.

lished fact that thorough spraying at the proper time will materially lessen the damage done by flea beetles. If flea beetles are not, at least partially, checked by spraying it is positive proof that the work has not been done properly. There seems to be very little danger that the work of potato spraying will be overdone, and the maximum profit cannot be realized unless the work is done most thoroughly.

(Continued on page 319.)

A Country Without an "If"

By Mark Bennitt.

Southern Idaho has been in the limelight for half a dozen years as the seat of the greatest irrigation work of modern times, or of any other times, however remote.

The Twin Falls region has blazed out in the sky of western progress like a comet, brilliant, scintillating and interesting because of its novelty and the bumptious spirit which it manifests.

The Twin Falls country is a country without an "if." There is no negative quality. Nobody is hanging back. Everybody is in harness and pulling some of the load, if load it may be called when a whole population is fired by enthusiasm and stirred with a purpose to build a great new social structure with irrigation as its foundation.

"What are the adverse conditions?" is a frequent question. There aren't any to the man who knows Idaho. The sun shines, the waters flow, the seeds germinate, the trees put forth their blossoms, leaves and fruit. "Ifs"

and a broad and liberal policy on the part of organized capital. The means to construct the costly and extensive irrigating systems there to be found have been forthcoming without delay, without hesitation. Never has there been a hitch since these great systems were begun. The money has been ready for every feature of the work. Nothing but adverse weather or physical conditions temporarily insurmountable have delayed the progress of construction since the day it was started.

The crowning work on the Twin Falls North Side canal system has been done during one of the severest winters ever encountered in the Northwest. Water was delivered for irrigation for the first time last season. Every canal was newly made and the seasoning and settling process had to be gone through with. The earth was almost as dry as if it had been run through a calcining oven. It drank up the waters as though its capacity were beyond its bulk. The season's trial determined the irrigating company to spend another half million, if necessary, to make the Twin Falls North Side canal system one of the most perfect in the world. This is the task that has been done during the last winter.

The accompanying illustrations show a part of the winter's work, namely, the cemented portion of the main North Side canal. From the great dam at Milner, which raises the water of the Snake river nearly 50 feet above



Main irrigation canal, Twin Falls North Side tract, showing treatment of canal banks through earth cut.

were not made for the Twin Falls country. It is a region of positives. It is a country buoyant with a hope that is justified and expectations that are certain of realization.

A new school of engineers has come into existence with irrigation development. The one has developed the other, and they are a happy combination—the man who knows how to do things and the material with which to do them. We must not forget the promoter and the capitalist. It is one of the facts of finance that capital waits for the promoter, the man with far-reaching and prophetic vision, the man of imagination who sees clearly the finished accomplishment. As the architect discerns in his imagination the beauty and enduring form of a great building before he has ever put it on paper, so the promoter sees the finished railroad with new and prosperous towns along its right-of-way, or he sees a desert transformed into a country dotted with homes and towns and producing food for a million people, all the result of the construction of an extensive irrigating system. The promoter thinks in large figures, harmonizes capital and working organization, points the way to successful investment and the doing of great deeds.

The unparalleled development of irrigations in the Twin Falls country of Southern Idaho is a monument alike to the unfaltering determination of the promoter

the low water level, this canal is lined with a smooth surface of concrete for nearly two miles. To do this work, extensive preparations were necessary. The assembling of men and material was alone a large task. To shut off the water from the canals in summer would have brought great loss to settlers and a liability which the irrigating company would not willingly incur, although the work would have cost far less during the summer season.

Persons unfamiliar with Southern Idaho do not realize the extreme aridity of that part of the country. In the government reports it is classed as a region where the total annual rainfall is less than 10 inches, and where the sun shines more than 300 days in the year. Water is an absolute necessity for agriculture, although the region has been a favorite grazing country for many years. But thanks to the Snake river, one of the great streams of America, millions of acres are being made more valuable than Mississippi bottom lands for agriculture and horticulture. A single season without water for irrigation would have meant serious loss to those already settled upon the new farms. Hence the decision to do this giant's task during the winter months. Adverse and unusually severe weather brought one problem after another, but the most serious was the freezing of the new concrete lining almost

before it could set. There was but one way to overcome this trouble, and that was to keep the temperature in the canal above the freezing point. This would have been easy if it were only the matter of a cellar wall for a cottage, but here was a work equivalent to the foundations of a thousand dwellings, all to be done in the space of a few months. There was but one thing to be done, and in doing this the problem was solved. A huge shed was built over the canal, and a large number of stoves were put in, requiring special detail of men to keep up the fuel supply and to watch the stoves and the temperature. This shed was 3,000 feet long, and as the work progressed the rear sections were taken down and put up at the forward end. The work was unique in the history of canal construction. The canal is 65 feet wide on the bottom, and the concrete sides are 9 feet high. This great conduit will carry water for more than 200,000 acres of land.

The lining of the great ditch was only a part of the winter's work. Throughout the great irrigating system, embracing a total of nearly 1,000 miles of canals and laterals, forces of men and teams were engaged in repairing and perfecting the work. The first season's use had been in the nature of a test of efficiency, and every weak point had been exposed. At every vital point throughout this irrigating system the most enduring type of construction is to be found. The weirs and settings for head-gates are

refreshing sleep on a May morning. There is no air more invigorating than that of Southern Idaho.

The annual migration from the eastern states is well under way, with every prospect of its unabating continuance. People who already have bought farms are taking possession of them with plans for their development and every train brings new arrivals bent upon becoming owners of irrigated farms while prices are still within their means.

Many people whose acquaintance with irrigation is limited are often curious to know what it is that makes an irrigated country so attractive. Perhaps crop insurance is the most attractive advantage. Not that there is an organization of capital to make up the losses due to unfavorable weather. It is, rather, an organization of favorable conditions—sunshine in great abundance every day during the growing season; water in equal abundance for keeping the crops moist, so that they may respond to the quickening power of the sun's rays; lastly, a soil that is easily tilled and rich with the elements that make big crops. What better assurances of success may any man have?

The soil of the Twin Falls country contains no problems for the agriculturist or fruit grower.

The following letter from Prof. Joseph E. Wing is a forceful and convincing statement. Prof. Wing is a mem-



Main irrigation canal, Twin Falls North Side tract, showing portion of heavy rock cut and concrete lining.

everywhere made of stone masonry and concrete, insuring a low maintenance cost for all time.

The people of the Twin Falls North Side tract are to be congratulated upon the superior character of their irrigating works. A much less thoroughly built system would ordinarily have passed inspection, as irrigating systems go, but in this we have an example of what irrigation works should be, considering that they are to serve the purpose of one generation after another for all future time. It is not an American custom to build at first in such a permanent way. Only in the older parts of the country do we ordinarily see construction work that is intended to serve more than a temporary purpose, so that this departure is especially worthy of note. It says in effect to the observer: "This population has come to stay. This is to be the permanent home of a progressive people."

The first season upon a newly irrigated tract is certain to be attended with many hardships, plan carefully as one may. More unforeseen things can happen than Horatio could dream of in his philosophy, and he probably was a pretty good dreamer. But the clear blue of the Idaho sky and the sunshine of hope in the settler's heart make him forget his troubles and see the early prosperity that is sure to come to the industrious irrigator. Spring has opened on the North Side tract with every heart bounding with the energy that a young man feels after a

ber of the faculty of the Ohio State University and a specialist in soils. He is a frequent lecturer in various agricultural colleges, one of the editors of the Breeder's Gazette and also of Bailey's Cyclopaedia of American Agriculture. His opinion of the Twin Falls country may be taken without question by anyone. This letter is positive in its statements. It contains no negatives and serves as further proof that the Twin Falls country is a country without an "if":

"WOODLAND FARM,"

Mechanicsburg, Ohio, Feb. 9, 1910.

Mr. H. L. Hollister, Chicago, Ill.

Dear Mr. Hollister: I have, as you know, traveled through every western state repeatedly and am familiar with nearly all the movements for settlement in the West. Furthermore, I once myself lived for many years on the frontier and watched the settlement making. I have just returned from Southern Idaho, where I saw your colonies along the Snake River. I am very happy in remembering what I saw there. Nowhere in the history of the world has there been brought together a finer lot of people than you have settled on those Idaho lands. Further, they have such splendid soil that they are sure to prosper.

I have never seen a more fortunate combination—the wonderful soil, the abundance of water, the fine climate,

(Continued on page 334.)

JOIN TO PROMOTE IRRIGATED LANDS

Seventeen States Represented at Important Meeting Held at Salt Lake City.

Showing unbounded enthusiasm and sturdiness of purpose, delegates from seventeen irrigated states met at Salt Lake City, April 4, and permanently organized the United Exposition Association of Irrigated States, and adopted resolutions affiliating the body with the National Farm Land Congress of Chicago.

The united association proposes to use its power in every way possible to bring about all kinds of legitimate publicity to the advancement of farming in the United States, and particularly throughout the irrigated states.

Upon the permanent organization of the association, which was temporarily established during the United States Land and Irrigation Exposition held at Chicago last November, permanent officers were elected for the forthcoming year. They are all men thoroughly familiar with irrigation as well as the best means of securing publicity, which means advancement for the farmer.

united association had not been accorded right treatment by the Chicago newspapers during the United States Land and Irrigation Exposition. This was accounted for by the fact that one daily paper in Chicago was backing the exposition, and this caused the other newspapers to keep silent.

A comprehensive speech was made by C. A. Walsh of Chicago. He reviewed the history of the United States Land and Irrigation Exposition, which had caused the western farmers to think they were not getting what they started for in exhibiting at the exposition—namely, publicity.

He stated that he had started West in 1908 to get in touch with western commercial organizations for the purpose of organizing a body such as the present National Farm and Irrigation Congress, and that it was not known at that time that the Chicago publication contemplated such a move.



Main irrigation canal, Twin Falls North Side tract, showing new concrete lining. Width of canal at bottom, 65 feet. Perpendicular height of concrete walls, 9 feet. Milner dam in distance.

The newly elected officers of the United Exposition Association of Irrigated States are:

President, C. J. Sinsell, Boise, Idaho.

Secretary-treasurer, Reilly Atkinson, Boise, Idaho.

First vice-president, H. M. Gilbert, North Yakima, Wash.

Vice-presidents, Prof. L. A. Merrill, Salt Lake; J. H. Wilson, Hood River, Ore.; C. E. Edwards, San Francisco; Dwight Woodruff, Hamilton, Mont.; B. C. Buffum, Worland, Wyo.; Lee Haney, Denver, Colo.; W. B. Henning, Albuquerque, N. M.; R. L. McMillan, Dalhart, Tex.; R. C. True, Reno, Nev., and John McMullin, Idaho Falls, Idaho.

The convention was opened with the appointment of committees necessary to permanent organization. Those present were: C. M. Hill, president of the Southern Idaho Commercial Clubs, headquarters in Twin Falls; C. J. Sinsell, temporary president, Boise; Reilly Atkinson, temporary secretary, Boise; J. H. Burns, Downey, Idaho; G. H. Shellenberger, Boise; J. E. Taylor, Salt Lake; Prof. E. D. Ball, State Experiment Station, Logan, Utah; Prof. L. A. Merrill, Salt Lake, director State Farmers' Institute; C. A. Walsh, Chicago; L. W. Johnson, Pocatello, Idaho; W. H. Coffin, Downey, Idaho; W. E. Wheeler, Idaho Falls, Idaho.

During different speeches it was brought out that the

Mr. Walsh presented two plans, which had been adopted by the congress to secure the maximum of publicity from the minimum of effort and expense; first, an educational congress, without exposition features, which could be conducted with no expense save the rent of an auditorium, the entertainment features and the incidental expenses of the organization; second, the same as the first, with an added feature in the form of a special exhibition feature, stocked by states and territories—the actual produce to be exhibited, with data covering cost of production, cost of land, freight rates, possible selling prices, etc.

This second plan was incorporated in the resolution adopted by the United Exposition Association of Irrigated States at a later meeting. The plan of Mr. Walsh, who is secretary of the National Farm Land Congress, is to use every news service, as well as various other syndicates furnishing material for weekly, monthly and special Sunday edition papers.

Reilly Atkinson spoke at some length, stating that he thought it was the opinion of those present not to hold an exposition themselves. He said that the United Association did not want to institute an exposition themselves, but would welcome gladly an opportunity to compete with other sections of the country in an exhibition of products.

Among other things embodied in the resolutions was that the United Association should assure itself that the sympathy and support of newspapers and press associations would be forthcoming before exhibiting in any city. The resolutions state further:

"Believing that the conference to be held in Chicago April 18, 1910, will result in the organization of an association in line with these resolutions, we recommend that the different states and territories send delegates to that conference with the object of aiding to effect and participating in such an organization of national scope, and instructed to vote as follows:

"For plan number two, as adopted by the National Farm Land Congress, November 20, 1909, at Chicago.

To demand that the association shall secure then and there a pledge of support from the Chicago Association of Commerce, the newspapers and press associations.

That the first exposition of the association be held at Chicago some time during the late months of 1910.

We request the governor of each state to appoint a delegate to attend the conference above mentioned.

That we appreciate the courtesy of Governor Spry of Utah in receiving the delegates to this convention, and his expression of sympathy with the purposes of the organization.

That the thanks of this convention be extended to

Cimarron—In the Valley of Content

"Westward the course of empire wends its way," is being reversed at Cimarron. The Arkansas Valley was first settled at the western end and Cimarron is the extreme eastern point. It is the newest of the new. Its opportunities are still embryonic. Its future, however, is assured.

This year in the Arkansas Valley promises to be a season of marvels. Even nature is behaving better than usual in a country where she always behaves well. The soil is exceptionally moist, the rainfall satisfactory, the reservoirs already partly filled in all parts of the valley.

The many orchards of the Valley of Content never gave better promise. The possible frost period is nearly past, but this doesn't worry the Arkansas Valley farmer, for he has, like his brother on the western slope, learned to smudge. Seldom is he forced to use the smudge pot, but he is ever ready to conquer Jack Frost when occasion demands.



Type of small Diversion Dam and Waste Gate used in improving coulees in the Twin Falls North Side Irrigation System and concrete work used throughout this extensive system.

the Commercial Club of Salt Lake City and its officers for the use of the club's rooms during our meetings, and the many courtesies extended."

Send \$2.50 for The Irrigation

Age one year and

The Primer of Irrigation

The Eighteenth Irrigation Congress at Pueblo means much to the entire valley and Cimarron will get its share of the great publicity that will attend this gathering, and Cimarron is ready to grasp that opportunity. The commercial organization has joined the Arkansas Valley Commercial Association, an organization created to boost the entire valley, and incidentally its individual communities. Cimarron is giving its undivided support to this movement.

Cimarron is also active in the Santa Fe Trail movement—the greatest good roads undertaking in the west. The article by R. H. Faxon, Secretary of the Board of Control of the Eighteenth Congress, published in the April issue of the AGE, has defined the importance of this great boulevard from Hutchinson, Kansas, to Pueblo, Colorado. Cimarron will also receive its share of the benefits to be derived in the future from the Trail.

When one sees the magnificent progress Cimarron has already made without irrigation, and recognizes the wonders irrigation has performed farther west in this valley and nearby country, Cimarron truly becomes a land of promise. A previous article has dwelt on the great ditch system building at present. Its unusual features have attracted attention throughout the irrigation world.

Sugar Beets.

Seven sugar mills are now in operation, providing sufficient sugar to furnish the entire population of the United States, men, women and children, with their total demand for sugar for thirteen days out of every year.

Cantaloupes.

The Rocky Ford brand of cantaloupes is so well known that it needs no comment as to quality. It is highest in demand in the market and is grown in all parts of the valley.

One hundred dollars an acre is not an exceptional return from cantaloupe land per season, and where a high degree of intensive farming has been attained this figure has been doubled and trebled.

These are sure irrigation crops, but let us not forget the great increase in product and quality irrigation produces in alfalfa and small crops.

Finally, the six thousand acres of apple blossoms now waving at the head of the valley, and the thousands of acres being developed in fruit at every point in the valley must not be overlooked.

As surely as the west grows and waxes great, so surely will a few years see Cimarron the center of a garden spot, carpeted with the pleasing green of the alfalfa and perfumed by the sweetness of the apple blossom.

can be made by showing the productiveness of this section.

"One grower in Otero County was paid \$1,822 for his crop of sugar beets from twelve acres, an average of \$151.67 per acre. Another, in an entirely different section of the county, received \$1,451.41 from ten acres, an average of \$145.14 per acre.

"While the sugar beet industry, for instance, has become established, yearly the growers are becoming more and more interested in the culture of their crops; not only from a tonnage standpoint, from which they have received their pay, but also from a sugar content point, on which the manufacturers depend for their returns. For the past years the beets have been paid for at so much per ton, \$5 being the usual price. The method of payment for the beets has changed in the last year to a minimum of \$5 per ton for beets carrying the minimum amount of sugar content, and 25 cents per ton for each one per cent of sugar in the beets over the minimum. A grower, therefore, producing 18 per cent sugar content beets receives 25 cents per ton over the minimum of 14.9 per cent, or \$6 per ton, for his crop. Beets of that quality are only produced by extra effort, for which the grower is well paid."

REVIVE A PROJECT.

Assistant Secretary of the Interior Pierce issued an order which will serve to revive a large irrigation project



Main irrigation canal, Twin Falls North Side tract, showing heavy rock cut and concrete lining. This canal will supply water for more than 200,000 acres of land.

Elmer T. Peterson is secretary of the Commercial Club. This club will furnish all information gladly to all inquirers, as to soil and water conditions, water rights, land opportunities and business chances.

The following relates to the Valley of Content. Cimarron will soon be the center of intensive farming:

"It is estimated that one man and team can handle forty acres of melons in the cultivation up to harvesting. The average is about 150 crates per acre, which, at 70 cents per crate, represents a value of \$105 per acre, or over \$4,000 for the forty acres. This on land which is valued at from \$75 to \$500 per acre, dependent entirely upon water rights and distance from the market points. Hauling is a factor to be considered in handling the crops from irrigated and intensive farm lands, and it bears a decided effect upon the prices of lands. It is estimated that it costs 15 cents per ton per mile to haul crops to the shipping points, a factor which amounts to a considerable item in the course of a year's hauling, if the farm is situated some miles out.

"The growers of one county last year received, approximately, \$1,750,000 for sugar beets, an enormous amount to be distributed in the section, considering the acreage. An explanation of the amount paid to growers

at Phoenix, Ariz., in which a syndicate of Cincinnati and southern Ohio capitalists is interested. There are two tracts of land affected, one of 30,000 acres and the other of 72,000 acres, which were purchased about twenty years ago by a party consisting of Dr. C. D. Walton of Cincinnati, M. C. Kinney, J. K. Cullan, William H. Beardsley of Hamilton, the late H. R. Morey, C. D. Oglesbee and Captain Robert Wilson of Middletown. This syndicate had expended about a quarter of a million dollars in constructing a dam and digging ditches. Water was about to be turned on, when, in 1902, a blanket order was issued withdrawing this land from settlement. Since that time the syndicate has been trying to induce the officials of the Interior Department to reverse the order. Efforts in this direction were unsuccessful until Representative James M. Cox of Dayton made a proposition to the Interior Department by which the government is to exchange the Arizona land for another tract which is located in the Moqui Indian Reservation, which the syndicate has purchased. After working on the exchange for a couple of months the agents of the land office have completed the transfer of the 39,000 acres of land, and it is expected that the other tract of 72,000 acres will be turned over to the syndicate in the near future.

Antelope Valley

New Mexico

The Properties of the French Land & Irrigation Company
Are Located in This Famous Valley

It is said by the inhabitants of Colfax County, New Mexico, that there is no other single county in the United States which combines within itself so many of the essentials which go to make up the requirements of a home.

Within this county are located 35,000 acres of the finest coal in the United States. On the slopes of the Raton and Taos mountains are 500,000 acres of merchantable timber, principally yellow pine and cedar. In the mountains on the western boundary are rich and productive mines of gold and copper.

These extensive resources, which are being rapidly developed, require a vast army of men, and are furnishing a steady and growing market for the products of the irrigation farmers in that vicinity. This makes land which is being irrigated on the eastern slopes of the mountains and on the mesas out from the slopes especially valuable.

charge of this immense tract, comprising 125,000 acres, which has been developed under the able generalship of Sophus Richard, who fills the position of general manager and treasurer of the company.

The first purchase of 50,000 acres of land, which was developed by the company, was made from the U. S. Land & Cattle Company, and contemplated the construction of two irrigation systems with seven large reservoirs, for the storage of 2,819,720,000 cubic feet, or approximately 75,000-acre feet of water. These reservoirs may be filled twice annually, thus doubling the capacity. These two systems divide the tract into two parts, which are locally known as the North and South Side tracts, each containing about 25,000 acres.

The South tract is at present under irrigation and during the season of 1909, something like six or seven thousand acres were cultivated advantageously and profitably. During the season of 1910, just opening, it is estimated that the amount of land which will be sown to crop, will aggregate 12,000 acres, the greater part of this will be worked by the owners, who are actually residing upon the land.

The second purchase made by this company, of about 75,000 acres, consists of 35,000 acres of irrigable land, for



Preparing land for irrigation, near French, New Mexico.

These facts were brought to our attention by conversation with one of the officials of the French Land & Irrigation Company, whose lands are located adjacent to the town of French, fifty-four miles south of Trinidad, Colorado, and eighty miles north of Las Vegas, New Mexico, in what is generally known throughout the section as the Antelope Valley, which is destined to become one of the beauty spots of western America.

The water to irrigate these lands is secured from the Cimarron and Mermejo rivers and the Ponil, Cerrososo and Van Bremmer creeks, all of which rise in the Taos and Raton mountains, lying to the west and northwest, with a drainage of about 1,500,000 acres, or 2,300 square miles. The water rights on these rivers have been approved, and are the first rights, with the exception of a few ranches which have been under cultivation for a number of years. The annual precipitation of moisture in these mountains is much greater than in the lower valley land, and average for a series of years from 20 to 25 inches annually.

The French Land & Irrigation Company, which has

which sufficient water is available, and 20,000 acres of good merchantable pine timber, while the balance is considered excellent grazing land, which will prove a valuable feature to contemplating settlers, who are inclined to go into the stock raising business. This second purchase necessitates a third irrigation system, to be constructed in the near future, which will not be a part of or in any way connected with the two systems formerly mentioned.

The early purchasers on what is designated as the South tract have noted the rapid advance in the price of their lands until the majority of them can readily sell for twice the price paid, and all this has transpired within the short period of two years. Persons who secure land in any one of the tracts mentioned have all the advantages of the improvements which are made on the South tract, including those of good neighbors, suggestions as to the best method for irrigation which may be obtained by contact with these neighbors, as well as the town advantages to be had by reasonable proximity to the growing town

(Continued on page 332.)

THE CAREY ACT

HOW TO ACQUIRE TITLE TO PUBLIC LANDS
UNDER THE ACT.

A Comprehensive Survey of the Regulations in Force
in the Various States.

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(Member Executive Comm., 18th Nat'l Irrigation Cong.)

VI.

THE WATER—Continued.

General Summary of Regulations.

Cost of Water Rights.

The cost of water rights reflects in an unmistakable manner the increasing use and needs of land in the arid and semi-arid districts.

The earlier projects, as a matter of course, were undertaken in localities where the difficulties of bringing water to the land were at their lowest. As the more easily available land and water resources were appropriated, it became necessary to go further for the water—more expensive engineering problems were encountered and greater expense of administration entailed. On the earlier projects, in many cases, the cost of water rights was fixed with insufficient knowledge of the difficulties to be overcome and the cost of "rights" at times was fixed too low. In some instances the Boards, subsequently, allowed an increase of lien. In Idaho, the earlier projects were opened to entry at as little as \$20.00 per acre a price, today, absurdly low. Upon present day projects, in Idaho and Wyoming, the cost of water rights ranges from \$40.00 to \$65.00 per acre; in Colorado, from \$35.00 to \$45.00; in Utah, from \$45.00 to \$70.00; in Montana, from \$40.00 to \$50.00; in Oregon, \$40.00 upon the only project having lands open to entry.

Terms of Payment for Shares.

In all States the entire purchase price for shares may be paid at time of entering into contract, or any unpaid balance may be paid at any time prior to date of last payment. As a rule the annual payments are fixed at a low figure during the first years of the contract, increasing in amount towards the end of the periods.

IDAHO—Determined by State Land Board in contract with constructing company—from 1-10 to 1-12 down, balance in from ten to twelve annual installments, with interest at 6 per cent. In case of delay in delivery of water, payments are advanced in time according to such delay.

WYOMING—The statutes prescribe that, not to exceed one-fourth of the contract price, may be demanded as first payment—company may accept less—balance in from ten to twelve years, with interest at 6 per cent. Same provision for delay in delivery of water as in the case of Idaho.

COLORADO—"Usually 10 to 12 years' time, with interest at 6 per cent. Payments advanced in time according to delay in delivery of water, if any."

UTAH—Ten to twelve annual payments. Interest at 6 percent. In case of delay in delivery of water, settler is obligated to make payments as in contract provided,—such payments to be held in escrow by the State Land Board.

MONTANA—From twelve to fifteen annual payments, with interest at 6 per cent. Settler's first payment protected by company's bond. (See "Protection of Settler's First Payment.")

OREGON—One-fourth cash (or less at option of company)—the balance in from three to seven annual installments, with interest at 6 per cent.

NEW MEXICO—Payments to be made in not more than ten annual installments—with interest at 6 per cent. Settler is obligated to make yearly payments, as in the contract provided, even though there be delay in delivery of water,—being protected by company's bond, which is increased each year according to receipts from such yearly payments.

In all cases where payments are not made when due, the company, among other remedies, has the right to refuse

the further delivery of water. (See "Forfeiture of Entryman's Rights and Redemption.")

Maintenance Fee—(Toll).

The "maintenance fee," as its name indicates, is the charge necessitated for the upkeep, or maintenance, of the irrigation works. It is in every case, payable whether water is used or not. It is levied by the company operating the "works," whether the "constructing" company or the "operating" company, and the payments are made to one or the other, as in the contract provided. The amount to be assessed against each acre is stipulated in the contract, and cannot be increased until control of the works passes into the hands of the settlers, themselves. The company is obligated to pay its pro rata share according to the amount of lands unsold, and if the amount specified be insufficient, the company must make up the difference. This matter has been made the subject of special legislation, in some instances,—vide Wyoming Statutes 1909, Chapter 160, Section 5 "Companies (et al)" shall be authorized to levy such reasonable assessments for the cost of operation—as may be authorized by a majority of the members of such companies or associations. Payments of such assessments shall be the necessary requisite for the use of such (works) and in the event they remain unpaid more than ten days after the date fixed—such company (or others) are authorized to close down any diverting device used by such delinquent person until such assessments are paid," etc. All contracts provide, also, that unpaid tolls shall be a lien against the land and any interest in the system. Maintenance fees vary as between different States, and according to the nature of the works, and the ground passed over. At the present time they are as follows, viz.: Idaho, 35c to 80c per acre; Wyoming, 40c (maximum); Colorado, 50c to \$1.00; Utah, "not to exceed \$1.00"; Montana, 40c to \$1.00; Oregon, 80c to \$1.25, "based upon actual number of acres irrigated."

Notice to Settlers That Water Is Ready for Delivery— How Served.

IDAHO—Notice published in one newspaper in county in which land is situated. Companies, at their option, may serve notice by mail. "Regulations" provide, also, that company must furnish a list of lands for which water is actually available to the Land Board for approval, before giving notice to the entryman that water is ready for delivery.

WYOMING—Notice by newspaper publication and by mail.

COLORADO—Notice by registered mail.

UTAH—By publication and by mail.

MONTANA—By publication and by mail.

OREGON—By mail.

NEW MEXICO—By newspaper publication during four weeks in the county in which land is located.

Rebate of Water Charge Where Part of Entry Is Non-Irrigable, or Is Appropriated for Non-Agricultural Purposes.

When parts of entry cannot be reached by gravity flow of water, or are absorbed by company's ditches (See "Right of Way")—in some cases, also, where railroad or wagon road, right of way, or right of way for other public enterprises, is appropriated, the State Land Boards have, so far as the question has assumed tangible proportions, either established definite rules governing the payment of water charges for such non-irrigable portions, or are disposed to judge each case upon its merits. So far as statements made by the Land Board officials justify expression and in the absence of Statutory "Carey Act" provision (disregarding other State Statutes) the practice in the various States may be described as follows, always bearing in mind the important fact that lands appropriated for canals or roads may *not* call for a rebate—this question being determined in every instance by the contract with the State. Lands too high to be reached by gravity flow are usually regarded, without question, as calling for rebate of water charges, as below specified.

IDAHO—Company permitted to charge for exact acreage irrigable only. The custom is to make contracts for the entire legal subdivision entered, and then to allow the rebate.

WYOMING—Five acres out of each entry is the maximum amount of non-irrigable land allowed without rebate. If the tract comprises only 40 acres, the settler is assumed

to make an agreement with the company for the acreage actually irrigable.

COLORADO—Some contracts provide that the charge for five acres (minimum), or any amount in excess of five acres, may be rebated—the practice in the future will be to demand rebate for the actual amount involved.

UTAH—"The company may sell water for irrigable area only."

MONTANA—"Two or three acres would not warrant a rebate—beyond that the company may charge only for exact area irrigable."

OREGON—"The land is contoured and the lien fixed on the basis of \$40.00 (this refers to the only project at this date open to entry), for each irrigable acre, and \$2.50 per waste acre—deduction being made for road and canal right-of-way."

NEW MEXICO—Company's contract with the State (Section 10) provides: "If it shall be found that there is land in excess of five acres on any legal subdivision of 40 acres, which is not susceptible of irrigation by gravity canals, at reasonable expense, a proportionate reduction shall be made for such excess of five acres,—to be deducted from the final payment, unless in excess of such final payment—in which case it shall be made from the next preceding payment." Under the "regulations," the same rule holds good in cases where land is condemned for canals or roads or public works.

Water—How Close to Individual Entry.

IDAHO, UTAH, NEW MEXICO—Company is to deliver water within $\frac{1}{2}$ mile of each entry, regardless of acreage of entry.

WYOMING—Practice under contracts now in force varies—from $\frac{1}{2}$ mile to 3 miles from each 160 acre subdivision. On future segregations, the company will be required to bring water to boundary line of each tract entered.

COLORADO—Some contracts require water to be brought within 3 miles of entry. In future contracts, companies will be required to deliver water within $\frac{1}{2}$ mile of each 160 acre subdivision.

MONTANA—Water to be brought within one-half mile of each 160 acre subdivision.

OREGON—"Water shall be measured at or within one-half mile of the place of intended use, and delivered to lands of each settler at the highest practicable point."

Measurement—Delivery—And Distribution of Water.

These matters are governed largely by local statutes and practices in each State. The only States in which specific mention of the subject is made in Carey Act Statutes or Contracts are as follows, viz.:

MONTANA—"Water to be delivered where sub-laterals leave main laterals. Company may serve water by rotation."

OREGON—"Water to be measured one-half mile from place of use. Company may serve water by a system of rotation upon ten days' notice, under such reasonable rules as may be approved by the Board. All necessary gates, etc., for taking water at point of delivery to be installed by company at settler's expense."

In all cases where water is not to be delivered at the boundary line of the settler's land, the settler himself must bring it to his land, and, as a matter of course, must construct all necessary ditches upon his land.

Duty of Water (i. e., Amount to be Delivered to Settlers).

The "duty" of water depends upon many factors—soil, climatic conditions, natural precipitation, length of irrigation season, and the character of crops to be grown.

IDAHO—Usually fixed at 1-80 of a cubic foot per acre—per second—equivalent, in practice, to 3 acre feet during the irrigation season (enough to cover each acre to a depth of 3 feet.)

WYOMING—1/80 cubic foot per acre, per second—in technical language "1/80 second foot."

COLORADO—Varying from 1/100 to 1/80 cubic feet per acre.

UTAH—Varying from $1\frac{1}{2}$ to 2 "acre feet," during irrigation season.

MONTANA—At present, 1/100 cubic feet to acre when served from direct flow of stream,—when from reservoirs, varying from $1\frac{1}{2}$ to $1\frac{3}{4}$ acre feet.

OREGON—Varying from 2 to $2\frac{1}{2}$ acre feet. Only contract now in force provides for "enough water from April 1st

to November 1st," and, specifically, for "1 8/10 acre feet between May 23d and August 20th."

NEW MEXICO—Varying from $1\frac{1}{2}$ to 3 acre feet per season—according to location and amount of rainfall—maximum in any case 1/70 cubic feet per acre.

Waste of Water—Pollution of Irrigation Water.

Prohibited by "Irrigation Statutes" of all States.

Right-of-Way for Settler's Laterals.

In all States a right-of-way is granted the settler to bring his laterals over an intervening entry, should it be the only practical way to reach his land. It is expected that this privilege will be guarded somewhat. Should any controversy arise in this connection, an investigation will be made by the State Engineer, who will designate the most feasible route for the ditch. As a matter of course, where company's contract calls for delivery of water at settler's land, this question would not arise—the company in any case, having right-of-way over entire segregation.

Irrigation Seasons.

In all States prescribed in "Irrigation Statutes," by local customs, or defined in contract between State and company.

IDAHO and WYOMING—Varying between May 1st and October 15, depending upon climatic conditions.

OREGON—One contract now in force specifically calls for delivery of water between April 1st and November 1st.

NEW MEXICO—Contracts between company and settler define, specifically, the dates between which water is to be delivered.

Rights of Way for Roads.

Usually supposed to be granted along section and half-section lines, without recourse. The information herein contained should not be accepted as governing in all cases. The settler on each project must determine the exact status himself. This subject is specifically mentioned in contracts in force in two states, viz:

MONTANA—Contract between State and company provides that all entries and patents for Carey Act Lands, shall be made subject to rights-of-way, without compensation, for roads upon all exterior section lines, and for other roads, not exceeding 60 feet in width, as the company may request; the location, and necessity therefor to be subject to approval of the Board before the lands are patented by the State.

OREGON—Reservations in settler's contract, for roads—(See "Contract between Company and Settler—Oregon.")

In other States:

IDAHO—Roads built upon petition by settlers to County Commissioners.

WYOMING—Roads are established by the County Commissioners, when deemed necessary, upon petition of parties interested. Rights-of-way may be condemned, if needed.

COLORADO—Settlers apply to County Commissioners for roads.

UTAH—County Commissioners have full power in the matter of roads.

NEW MEXICO—All section lines are road lines by order of government special agents, no Territorial Act covering this point.

(a) Domestic and Stock Water to be Supplied by Company. Delivery of Water by Rotation.

(b) Installment of Headgates and Measuring Devices—By Whom Effected, and at Whose Expense.

(c) Ownership of Water After Leaving Settler's Ditches.

(d) Responsibility of Company for Possible Damage Due to Leakage, or Breakage, of Company's Canals. Proration of Water in Case of Shortage.

It is impossible to make any definite statement touching upon these features that would fit every case. Should the necessity for an inquiry arise, it would be a matter to be determined by, or for, the settler himself. In many cases, any, or all, of these situations would never arise, and a discussion of them would be purely academic. In other cases the questions are answered by law or custom, or by the specific features of the contract governing.

(Continued on page 338.)

CAREY ACT PROJECTS

HAVING LAND OPEN TO ENTRY, OR AUTHORIZED TO SELL WATER CONTRACTS
(MAY 1, 1910).

The figures given indicate, in every instance, the total acreage of "Carey Act" lands under the various projects, as segregated, or open to entry, at this date, and disregarding state or private lands, or lands entered under United States Public Land Laws, prior to the segregation of the "Carey Act" lands. They are not conclusive as to the amount of land remaining unentered, which may be great or small. In many cases "relinquishments" of entered lands, or lands which have been "proven up," or patented, may be purchased from original entrymen.

The prices named represent the original prices established by the state for water-rights and apply to the "Carey Act" lands under the various projects, only.

The price exacted by the state for the land must, in all cases, be considered in connection with the cost of water-rights.

To avoid correspondence, which, at some future time, might be unnecessary and troublesome, the suggestion is offered, in the case of states having many projects open to entry, that the homeseeker write to the state department or official, indicated in connection with the list of projects, before corresponding with the companies directly. For information regarding specific projects inquiries should be directed to the companies, themselves. Residents of the eastern states will find it convenient and expeditious to correspond with the eastern offices of companies possessing such facilities. Where such offices are maintained, they are referred to in connection with the companies' home offices. For information regarding the resources of the state at large, inquiries should be addressed to the department or officials indicated in the list appended.

IDAHO.

(The total amount of land granted by Congress to the State, under the provisions of the original act and of amendments, up to May 1, 1910, is 3,000,000 acres. The information herewith presented represents conditions in Idaho existing on January 1, 1910, as later data has not been procurable.)

Canyon Canal Company, Boise, Idaho; 5,829 acres in Canyon County; price of water rights, \$30 per acre.

Huston Ditch Co., Darlington, Idaho; 1,884 acres in Blaine and Custer counties; price of water rights, \$35 per acre.

Portneuf-Marsh Valley Irrigation Co., Downey, Idaho; 12,222 acres in Bannock County; price of water rights, \$35 per acre.

Twin Falls-Oakley Land & Water Co., Milner, Idaho; 43,694 acres in Cassia County; price of water rights, \$65 per acre.

Kings Hill Extension Irrigation Co., Boise, Idaho; 9,455 acres in Elmore County; price of water rights, \$65 per acre.

Twin Falls Salmon River Land & Water Co., Milner, Idaho; 80,000 acres in Twin Falls County; price of water rights, \$40 per acre.

The Marysville Canal & Improvement Co., Boise, Idaho; 6,782 acres in Fremont County; cost of water rights, \$20 per acre.

American Falls Canal & Power Co., Blackfoot, Idaho; 57,242 acres in Bingham and Blaine counties; cost of water rights, \$40 per acre.

West End Twin Falls Irrigation Co., Des Moines,

Iowa; 46,016 acres in Twin Falls and Owyhee counties; price of water rights, \$40 per acre.

Pratt Irrigation Co., Stone, Idaho; 4,516 acres in Oneida County; price of water rights, \$40 per acre. This segregation to be opened May 12, 1910.

Big Lost River Irrigation Co., Boise, Idaho; 80,000 acres (approximately) in Blaine, Bingham and Fremont counties; price of water rights, \$40 per acre.

Kings Hill Irrigation & Power Co., Boise, Idaho; 12,000 acres (approximately) in Twin Falls and Owyhee counties; price of water rights, \$65 per acre.

Twin Falls North Side Land & Water Co., Milner, Idaho; total of three segregations, 235,000 acres; in Lincoln and Elmore counties; price of water rights, \$30, \$35 and \$45 per acre. (There is also a considerable amount of deeded land under this project.)

Twin Falls Canal Co., Office Twin Falls; 244,000 acres in Twin Falls County; cost of water rights, \$25 per acre. (This is the segregation of the original "Twin Falls Land & Water Company," which has been deeded and transferred to the "Twin Falls Canal Company"—the Settlers' organization. It is the project commonly known as the "Twin Falls South Side project.")

Idaho Irrigation Co., Richfield, Idaho; 157,721 acres in four segregations, as follows, viz.: Richfield tract, 40,821 acres; in Lincoln and Blaine counties; price of water rights, \$35 per acre; North Shoshone and North Gooding tracts, 55,019 acres in Lincoln County; price of water rights, \$35 per acre; South Gooding tract, 14,957 acres in Lincoln County; price of water rights, \$35 per acre; Dietrich tract, 46,924 acres in Lincoln County; price of water rights, \$50 per acre.

WYOMING.

(The total amount of land allowed this State by the Federal Government up to May 1, 1910, is 2,000,000 acres.)

It is not customary to have land drawings, as in the case of many of the other Western States, as the bulk of the settlement is accomplished through private contract with the individual. After the land is open for settlement, it is the case of "first come, first served." The companies are, however, authorized to conduct land drawings, under jurisdiction of the State Land Board, if requested, if they so desire.

It is suggested that inquiries, of a general nature, about Carey Act projects, be directed to "R. L. Fuller, Commissioner of Public Lands, Cheyenne, Wyoming."

North Laramie Land Co., Uva, Laramie County; 4,133 acres in Laramie County; \$37.50 per acre.

Sahara Ditch Company, Buffalo, Johnson County; 8,000 acres in Johnson County; \$40 per acre.

James Lake Irrigation Co., Laramie, Albany County; 14,563 acres in Albany County; \$50 per acre.

East Fork Irrigation Co., Boulder, Fremont County; 4,901 acres in Fremont County; \$30 per acre.

Cody Canal Association, Cody, Big Horn County; 11,111 acres in Big Horn County; \$40 per acre.

Boulder Lake Canal & Reservoir Co., Boulder, Fremont County; 6,221 acres in Fremont County; \$20 per acre.

Hanover Canal Co., "Hanover Canal," Worland, Big Horn County; 10,682 acres in Big Horn County; \$30 per acre.

Big Horn Basin Colonization Co., "The Sidon Canal," Lovell, Big Horn County; lands in Big Horn County; \$30 per acre.

Lakeview Irrigation Co., "The Hammitt Ditch," Cody, Big Horn County; 7,000 acres in Big Horn County; \$50 per acre.

North Platte Canal & Colonization Company, Wyncote, Laramie County; 14,424 acres in Laramie County; \$30 per acre.

French Creek Irrigation & Development Co., Encampment, Carbon County; 18,869 acres in Carbon County; \$35 to \$50 per acre.

Big Horn County Irrigation Co., "Big Horn County Canal," Basin, Big Horn County; 20,000 acres in Big Horn County; \$40 to \$50 per acre.

North Platte Valley Irrigation Co., "LaPrele Ditch," Douglas, Converse County; 60,000 acres in Converse County; \$30 to \$50 per acre.

Wheatland Industrial Co., Offices Cheyenne and Wheatland, Laramie County, Wyoming; 33,154 acres in Laramie County; \$45 per acre.

The Big Horn Basin Development Co., "The Bench Canal," Office Burlington, Big Horn County; 11,251 acres in Big Horn County; price of water rights, \$40 per acre.

Lovell Irrigation Co., Lovell, Big Horn County; 11,320 acres in Big Horn County; \$30 per acre. This company furnishes water also to 5,724 acres under the "Elk Canal."

Wyoming Land & Irrigation Co., "Shell Creek Canal," Basin, Big Horn County; Eastern Office, 1422 Marquette Building, Chicago; 52,000 acres in Big Horn County; \$50 per acre.

Eden Irrigation & Land Co., Rock Springs, Sweetwater County; Eastern Office, 421 First National Bank Building, Chicago, Ill.; 100,000 acres in Sweetwater County; \$30 per acre.

Routt County Development Co., Office care W. R. Given, 1742 Welton Street, Denver; 38,000 acres in Routt County; cost of water rights, \$35 per acre.

The Toltec Canal Co., Office care Henry M. Clark, 322 Cooper Building, Denver; 12,000 acres in Conejos County; cost of water rights, \$40 per acre.

The Colorado Land & Water Company, care I. B. Melville, 205 Symes Building, Denver; 16,000 acres in Laplata County. Cost of water rights, \$45 per acre, in addition to which there is an extra charge of \$1.25 per acre for the land in payment to the Ute Indians.

A number of other projects in the State are in varying stages of development.

UTAH

Inquiries with reference to Carey Act projects should be addressed to "The State Board of Land Commissioners, Salt Lake City, Utah."

Oasis Land & Irrigation Co., Salt Lake City; 43,120



This scene shows F. F. Burton, Petersburg, Colo., irrigating a crop of tomatoes. He has a Dempster 6 H. P. Horz. gasoline engine and a No. 2 centrifugal pump lifting the water 30 ft. vertical height through 100 ft. of pipe. No matter where you live a pumping plant to supplement the natural rainfall for watering crops is an excellent investment.

A number of other projects are in various stages of development at this time.

COLORADO

The method of opening lands to entry depends upon the wishes of the company. Lands may be opened by public drawing or by private entry, being subject to entry after a specified date, set forth in a notice of thirty days' publication.

Inquiries regarding Carey Act lands generally should be directed to "The State Board of Land Commissioners, Denver, Colorado."

The Two Buttes Irrigation & Reservoir Co., Lamar, Colorado; 22,000 acres in Prowers and Baca counties; cost of water rights, \$35 per acre.

acres in Millard County; cost of water rights, \$45 per acre. There are several other large projects in this state in various stages of development, not open to entry.

Beaver Land, Irrigation & Power Co., Office Salt Lake City; 48,227 acres in Beaver County; cost of water rights (not announced at this time). "Opening of 12,000 acres contemplated before spring of 1910." There is a large quantity of deeded and state land in this project, in addition to the Carey Act lands listed above.

MONTANA

Inquiries regarding Carey Act projects should be addressed "The Carey Land Act Board, Helena, Montana."

Conrad Land & Water Co., Valier; 103,000 acres in Teton County; \$40 per acre.

Glass-Lindsay Land Company, Big Timber; 63,750 acres in Sweetgrass County; \$40 to \$50 per acre.

Billings Land & Irrigation Co., Office Billings; 15,378 acres in Yellowstone County; cost of water rights, \$50 per acre.

OREGON.

Inquiries regarding Carey Act lands should be addressed to "The Desert Land Board, Salem, Oregon."

Deschutes Irrigation & Power Co., Bend; 100,000 acres in Crook County; cost of water rights, \$40 per acre. "Waste land" is charged for at the rate of \$2.50 per acre.

A number of other large projects are in various stages of development, but not yet open for entry.

NEW MEXICO.

There are several projects in New Mexico in varying stages of completion, but none of them, as yet, is open to entry. Information in regard to these may be obtained by inquiry of H. B. Hening, Secretary, the New Mexico Bureau of Information, Albuquerque, New Mexico.

SOUTH DAKOTA.

No segregations under the Carey Act had been applied for up to May 1, 1910.

NEVADA

Several applications have been made for Carey Act segregations, none of which has been approved by the Department of the Interior. Information with regard to these may be procured by addressing C. E. Deady, State Land Register, Carson City, Nevada.

Bureaus of Immigration or Other Official Bodies for the Dissemination of Authentic Information Regarding the Resources of the State Generally.

IDAHO.

Bureau of Immigration, Labor and Statistics.
Address—Boise.
Jos. P. Fallon, Commissioner.

WYOMING.

Department of Immigration.
Address—Cheyenne.

UTAH.

Bureau of Statistics.
Address—Salt Lake City.
H. T. Haines, Commissioner.

MONTANA.

State Bureau of Agriculture, Labor and Industry.
Address—Helena.
J. H. Ball, Commissioner.

NEW MEXICO.

Bureau of Immigration.
Address—Albuquerque.
H. B. Hening—Secretary.

HOLLY, COLORADO.

The Sugar Beet, Cantaloupe, Fruit and Alfalfa Country of the Lower Arkansas Valley.

Holly, Colo., is located in the eastern part of the state, at the lowest elevation in the state (3,400 feet). The Arkansas Valley Sugar Beet and Land Company has its headquarters there, and also the headquarters of the Holly Sugar Co., a corporation capitalized at \$5,500,000.

This is the first of a series of articles telling of what is being done and what has been done in this live town just over the Colorado side, in the Valley of Content. All the irrigation world is having its attention directed more and more to this valley. The Irrigation Congress to be held at Pueblo, September 26-30, is responsible for the most of this. The new Santa Fe Trail good roads movement is responsible for some of it. Nine motor cars made the remarkable endurance run April 24 from Hutchinson, Kan., to Pueblo, Colo., 461 miles, in 23 hours, accompanied by guide and relay cars. The East and West were surprised at such evidence of good roads.

These cars passed through Holly on the Trail and through the thousands of acres of irrigated land comprising the country surrounding this garden spot.

The fertility of the soil, the marvelous growth of the little towns under the system, the climate, the good roads, the opportunities, all attract attention, but in this article let us consider the greatest body of water between the Great Lakes and Salt Lake, with the single exception of the Government Pathfinder dam.

The main canal is eighty miles long, coming out of the Arkansas River at Prowers, Colo. The following data must be stated first, to appreciate the magnitude of this system:

Reservoirs.

Name.	Area in acres.	Available capacity in acre ft.
Nee Noshe	4,236	67,180
Nee Gronda	3,285	53,950
Nee Sopah	3,425	20,496
Queen	1,990	26,128
Total	12,936	167,754

Canals.

Name.	Length in miles.	Cap'ity in second ft.
Fort Lyon	113.00	2,096.00
Kicking Bird	36.50	1,000.00
Satanta	12.50	300.00
Comanche	16.78	400.00
Pawnee	6.34	200.00
Amity	80.00	870.00
Buffalo	16.10	192.00

The reservoirs are filled by running water through the Fort Lyon and Kicking Bird Canals, which in turn take water from the Arkansas River. From the reservoirs the water is turned into the Amity Canal, through the Comanche and Pawnee Canals.

This water supply rests for its foundation upon earliest priorities in the Arkansas River, and such enormous reservoir capacity that a supply sufficient for two years' irrigation is always on hand. Think of a reservoir so long you cannot see across it—a body of water in a reservoir space made by man, comparing favorably with great

Send \$2.50 for The Irrigation

Age one year and

The Primer of Irrigation

natural lakes, and then you have only grasped one of four of these great artificial ponds. The total shore line is sixty-four miles, and if all the water were put in a canal a foot deep and a mile wide the canal would be over four hundred miles long.

One of the most important things to be considered by the settler on western irrigated land, where the water is taken from a river, especially, is the question of permanency of water supply. The Amity and Buffalo canals are among the earliest priorities on the Arkansas River. The Arkansas Valley Sugar Beet and Irrigated Land Company has spent millions of dollars in building and strengthening these canals, and placing at all points of danger indestruc-



VIEW ON AMITY CANAL NEAR HOLLY, COLORADO.

tible concrete structures, reinforced by steel, and finally in creating and maintaining the great system of reservoirs outlined above.

Twenty-four inches of water are guaranteed to every land purchaser.

As a result of this reclamation of the desert, there are now about fifty thousand acres under cultivation this year and prosperous farms with regulated running water greet the eye on every side. Alfalfa, the famous netted Rocky Ford cantaloupes, and fruits are making millions for the small land owners, where nothing but waste and sagebrush ruled a few years back.

The writer has again and again passed from these luxuriant gardens over a simple ditch into the old dry hardness of the plains and always stood aghast at the transformation brought by that magic little stream.

Naturally, money-making farmers need markets, and several towns have sprung up, the most important of which is Holly, although Hartman, Bristol and Wiley are growing as rapidly as towns in any irrigation district in the West.

Holly is located on the Santa Fe Railroad and is a considerable town, with live banks, business houses of all sorts, good hotels, etc. A magnificent new hotel is now being constructed and one will note evidences of prosperity, new building, and preparation for a greater little city on every hand.

It is at Holly that the sugar company has located one of its factories, the other at Swink, eighty-five miles

up the valley. The Holly and Swink, or better known as the Arkansas Valley Railroad, connects the two towns and reaches the other main market places under the irrigation system.

The beet factory at Holly sliced an average of 618 tons of beets each day during the entire season or "campaign" last year. Thus the farmer has a ready market for all the beets he may choose to raise. He can get five dollars a ton, and frequently raises twenty tons to the acre, or receives gross \$100 per acre per year.

The sugar factory, the great opportunity to raise big crops, the business chances in such a rapidly growing town, have attracted not only the speculator, but the solid, substantial business man, the farmer who has come to stay, and finally a group of live young men, some from the great eastern cities, many from the leading colleges of the country, and these young men have their shoulder to the wheel, are investing their money right where they



NEE NOSHE RESERVOIR.

The four reservoirs—Nee Noshe, Nee Gronda, Nee Sopah and Queen—cover 12,936 acres, and have a capacity of 183,360 acre feet of water. One cannot see across Nee Sopah. These, in the aggregate, are the largest body of water, in surface area, between the Great Lakes and Great Salt Lake, and greatest in available capacity, except the Government Pathfinder Dam. Over 100,000 acre feet of water is now on hand—before the spring rains.

are making it, have confidence in the future of their home and are building to last and remain.

There are so many points of interest about this great system that other phases of interest will be considered in subsequent articles.

WE would like to hear from a young practical irrigation engineer who understands the use, measurement, developing and storage of water for irrigation purposes. Communicate at once giving age, experience, references and salary wanted.

Work will be in the saddle part of the time and prefer an unmarried man. Address,
Alamogordo Improvement Co., Alamogordo, N. M.

Decisions of the Department of the Interior and of the Public Land Office

Fiscal Year Beginning July 1, 1909, to Present Date

HOMESTEAD ENTRY — CULTIVATION — RAISING OF HOGS—JUNE 8, 1909.

The use of land for the raising of hogs is an agricultural use and where the land is better adapted to that use than for tillage of the soil, meets the requirements of the homestead law with respect to cultivation.

RECLAMATION — IMPROVEMENTS — CONDEMNATION—SEC. 7, ACT OF JUNE 17, 1908.—JUNE 30, 1909.

Where the owners of the improvements mentioned in the preceding section shall fail to agree with the representative of the Government as to the amount to be paid therefor, the same shall be acquired by condemnation proceedings under judicial process as provided by Section 7 of the Reclamation Act.

ADDITIONAL HOMESTEAD ENTRIES WITHIN RECLAMATION PROJECTS.

In a letter of May 3, 1909, the Director of the Reclamation Service put the following questions, all of which were decided in the negative.

1. Whether a person who has made entry upon the public domain for less than 160 acres may make an additional homestead entry within a reclamation project.
2. Whether a person who has entered and proven up on a farm unit within a project may make an additional entry of public lands outside of the project, and
3. Whether a person who makes entry for a unit of less than 160 acres within a project may, after proving up upon same, make an additional entry within the same project.
4. Whether under the conditions of proposition 3 the entryman could make an additional entry on another project.

HOMESTEAD ENTRY — QUALIFICATIONS—OWNERSHIP OF LAND. GALLANT v. COLE, AUGUST 17, 1909.

One who holds land under an unperfected desert-land entry is not the proprietor thereof within the meaning of the statute holding disqualified to make homestead entry one who is the proprietor of more than 160 acres of land.

A transfer of land by one owning more than 160 acres, for the purpose of qualifying himself to make a homestead entry, is not a violation of law, provided the transfer is final and made in good faith.

DESERT LAND ENTRY—EXPENDITURES STOCK IN IRRIGATING COMPANIES.. WASHINGTON, D. C., AUG. 21, 1909.

That portion of Section 18 of the regulations governing entries and proofs under the desert-land laws, approved November 30, 1908 (37 L. D., 312), which relates to expenditures for stock or interest in irrigating companies, is hereby amended to read as follows:

Expenditures for stock or interest in an irrigating company through which water is to be secured for irrigating the land and which owns the right to the use of sufficient water to satisfy all valid claims therefor acquired by ownership of its stock or otherwise, will be accepted as satisfactory expenditures when claimant shall file and make a part of the annual proof.

(a) A receipt or other writing, signed by the proper officer or agent of the company, showing payment in cash for stock of interest in the company, and the affidavit of the claimant showing that the payment was made in cash and when made.

(b) An affidavit of the claimant showing the nature of the contract or agreement he had with the company entitling him to the use of water, and the quantity of water to which he is entitled under such contract or agreement, or proper showing that the ownership of the stock or interest entitles him to the use of water and the quantity of water to which he is entitled by virtue of such ownership.

(c) A statement, under oath, of the proper officer of the company, showing the right of the company to the use of water; whether such right is based upon a decree, or decrees of court, or upon appropriations or filings made in conformity to state or territorial laws; the source or sources of its water supply; the quantity of water owned or appropriated by it; the total quantity of water which it is under contract or agreement to deliver to its patrons and stock holders, and the date when, no unforeseen obstacle preventing, it will be able to deliver water on the land of the entry, which land must be described in the sworn statement.

RESERVOIR SITE—EXTENSION OF TIME FOR COMPLETION OF RESERVOIR. FULTON v. BUCHHOLZ, AUGUST 27, 1909.

The act of January 13, 1897, requires that a reservoir constructed under its provisions shall be completed within

two years from the date of the filing of the declaratory statement, and the land department is without authority to extend that period so as to defeat an intervening adverse claim.

COAL LANDS—SURFACE RIGHTS OF ENTRYMEN. ACT OF MARCH 3, 1909.

A circular under date of September 7, 1909, explains the purpose of the Act which is to protect persons who, in good faith, entered under nonmineral laws, public lands which are after such entry classified as being valuable for coal, by providing a means whereby such persons may retain the lands entered, subject to the right of the Government to the coal therein.

DESERT LAND ENTRY WITHIN RECLAMATION PROJECT —WATER RIGHT—PATENT. SEPTEMBER 13, 1909.

Final certificate and patent will not issue upon a desert land entry within a reclamation project until all payments for a water right under such project have been made and the water right permanently attaches to the land.

HOMESTEAD ENTRY—QUALIFICATIONS OF ENTRYMAN —OWNERSHIP OF LAND. REIBER v. STAUFFACHER, SEPTEMBER 75, 1909.

One holding the naked legal title to a tract of land to which he has no beneficial interest but holds as mere dry trustee for another who paid the consideration therefor is not the proprietor thereof within the meaning of section 2289 of the Revised Statutes, declaring disqualified to make homestead entry one who is the proprietor of more than 160 acres of land in any State or Territory.

RIGHT OF WAY—RESERVOIR SITE—JURISDICTION OF LAND DEPARTMENT. SEPTEMBER 20, 1909. ALLEN ET AL vs. DENVER POWER AND IRRIGATION CO.

Upon approval of an application for right of way for a reservoir site under the act of March 3, 1891, the jurisdiction of the Interior Department is lost, and any subsequent action looking to cancellation or annulment of the right of way for any reason whatever must be by direct action for that purpose in the courts.

The land department is without authority to approve an application for right of way under said act which conflicts to a material extent with a prior approved application under which vested rights have been acquired.

The five-year period fixed by the act of March 3, 1891, within which a reservoir under its provisions is required to be constructed to prevent forfeiture of the right of way can not be extended by means of an amended application for the reservoir site.

Upon failure to construct within the five-year period, the land department may not, in the face of evidence showing that another is seeking to acquire the land for a legal purpose, waive the requirement of the statute with respect to forfeiture, but should recommend the institution of proceedings to have the right declared forfeited.

DESERT LAND ENTRY—EXTENSION OF TIME FOR PROOF—ANNUAL EXPENDITURE—SEC. 3, ACT OF MARCH 28, 1908.

Section 3 of the Act of March 28, 1908, authorizing an extension of time for the submission of final proof upon desert land entries, where by reason of unavoidable delay in the construction of the irrigating works, the entryman is unable to make proof of reclamation and cultivation within the time fixed by statute, furnishes no authority for an extension of time to enable the entryman to submit proof of annual expenditure. Sept. 23, 1909.

HOMESTEADS WITHIN RECLAMATION PROJECTS—RECLAMATION PROOF — CONSTRUCTION CHARGES. SEPTEMBER 17, 1909.

1. Notice of acceptance to issue on proof of residence, cultivation, improvement, and reclamation.

Homesteaders who have resided on, and improved their lands for the time required by the homestead laws and have reclaimed at least one-half of the irrigable area of their farm units as required by the reclamation act, and have submitted proof which has been found satisfactory thereunder by this office, will be excused from further residence on their lands and notice will be issued to them reciting that the conditions of residence, cultivation, improvement, and reclamation have been complied with, and that final certificate and patent will issue upon payment of the charges imposed by the public notice issued in pursuance of section 4 of the reclamation act. In such cases, upon payment of the charges by the entryman, or in his behalf, final certificate, and patent, will issue in due course.

2. Homesteads where residence and improvement have been completed but reclamation not affected.

Homesteaders who have resided on, cultivated, and improved their lands for the time required by the homestead laws and have submitted proof which has been found satisfactory thereunder by this office, but who are unable to furnish proof of reclamation because water has not been furnished to the lands or farm units not established will be excused from further residence on their lands and will be given a notice reciting that further residence is not required, but that final certificate and patent will not issue until proof of reclamation of one-half of the irrigable area of the entry and payment of all charges imposed by the public notice issued in pursuance to section 4 of the reclamation act.

3. Full payment at option of entryman when residence.

cultivation, improvement and reclamation have been completed.

Upon proof of the residence, cultivation, improvement, and reclamation required by the homestead and reclamation laws, the parties in interest may, if so desired, exercise the option of immediately paying all installments of the building charges and the charges for operation and maintenance, whereupon final certificate and patent will be issued.

ADDITIONAL HOMESTEAD ENTRY WITHIN RECLAMATION WITHDRAWAL. SEPTEMBER 27, 1908.

The fact that lands are within a reclamation withdrawal does not prevent additional entry thereof under section 2 of the act of April 28, 1904, where farm units have not been established and where the first original entry, to which the additional entry must be contiguous was made subject to the restrictions and conditions of the reclamation act, the combined original and additional entry, however, being subject to adjustment to a farm unit when established.

DESERT LAND ENTRY—EFFECT OF ASSIGNMENT—QUALIFICATIONS OF ASSIGNEE. BONE v. ROCKWOOD, OCTOBER 2, 1909.

Where assignment is made of a desert land entry and the assignee recognized by the General Land Office, the entryman or person making the assignment thereby parts with his title to the land, even though it be subsequently shown upon contest or investigation that the assignee is not qualified to hold by assignment.

The charge that the assignee of a desert land entry is disqualified to take by assignment is sufficient basis for a contest.

HOMESTEAD CONTEST—CHARGE OF INADAPTABILITY OF LAND FOR AGRICULTURAL USE. DAVIS v. GIBSON, OCTOBER 14, 1909.

Land unadapted to any agricultural use is not subject to entry under the homestead law; and an affidavit of contest in effect charging such inadaptability is sufficient basis for a hearing.

RIGHT OF WAY—POWER PURPOSES—ACTS OF MARCH 3, 1891, MAY 11, 1898, AND FEBRUARY 15, 1908. KERN RIVER COMPANY, NOVEMBER 12, 1909.

A right of way under the act of March 3, 1891, may be acquired only by a company formed for the purpose of irrigation; but a right of way secured under that act may, under the act of May 11, 1908, be used for purposes of a public nature as subsidiary to the main purpose of irrigation.

A company organized chiefly for the purpose of generating and distributing power is not within the purview of the act of March 3, 1891, and where an application by such a company for right of way under that act has been approved, for lands now within a National Forest, the company may be permitted to relinquish all right under such approval and amend its application to bring it within the act of February 15, 1901, failing to do which, action should be taken by the land department with a view to revocation of the approval.

PUBLIC LANDS—AGGREGATE AREA UNDER PUBLIC LAND LAWS—ACT OF AUGUST 30, 1890. TRENTHAM v. COPENHAVER, NOVEMBER 13, 1909.

The area embraced within a homestead entry relinquished prior to the acquisition of title does not come within the provision of the act of August 30, 1890, limiting the amount of land that may be acquired by any one person under the public land laws to 320 acres.

RECLAMATION WITHDRAWAL — PROTEST — PAR. 6, REGULATIONS JANUARY 19, 1909. NEW CASTLE COMPANY v. ZANGANELLA, NOVEMBER 26, 1909.

Paragraph 6 of the regulations of January 19, 1909, to the effect that the prosecution of contests affecting lands included within a first-form withdrawal under the reclamation act, out of which preferred rights of entry might arise, should not be allowed, has no application to a protest by one claiming under a placer location against a conflicting desert-land entry, no question of preference right of entry being involved in such proceeding.

ENLARGED HOMESTEAD ACT—FEBRUARY 19, 1909. INSTRUCTIONS OF DECEMBER 14, 1909.

To Registers and Receivers—United States Land Offices, Colorado, Montana, Nevada, Oregon, Utah, Washington, Wyoming, Arizona and New Mexico.

Copies of Circular of Instructions as to Entry of Lands under this act may be secured free of charge, by application to the "Commissioner of the General Land Office, Washington, D. C."

RECLAMATION WATER RIGHT CHARGES—TRUCKEE-CARSON PROJECT—FIRST INSTALMENT JANUARY 10, 1910.

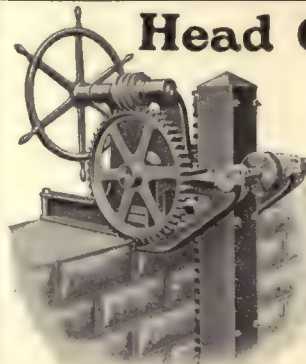
Where an entry within the Truckee-Carson reclamation project was made too late in the year 1907 to obtain any benefit by the use of water for the crop season of that year, the first instalment for water-right charges did not under the instructions of May 6, 1907, considered in connection with the instructions of August 5, 1904, become due until December 1, 1908.

NOTICE OF PREFERENCE RIGHT—LAND SUBJECT TO HOMESTEAD ENTRY—RELINQUISHMENT FOR CONSIDERATION—SECOND HOMESTEAD. FINLEY v. NESS, JANUARY 18, 1910.

Where a successful contestant is notified of his preference right of entry by registered mail, and the notice is received by him, the preference-right period begins to run from that date, excluding the day notice was received.

The fact that land is covered with valuable timber does not exclude it from entry under the homestead law, where of such character that it would be suitable for agricultural use if the timber were removed, but land of a character not adaptable to any agricultural use is not subject to homestead entry.

A homestead entryman who executes a relinquishment and places it in the hands of another, who disposes of it for a valuable consideration, is disqualified to make second entry under either the act of April 28, 1904, or the act of February 8, 1908, regardless of whether he actually received any part of the consideration for which it was sold.



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DESERT-LAND ENTRY—FINAL PROOF—RECLAMATION—DISTRIBUTION OF WATER. FEBRUARY 4, 1910.

Where the final proof submitted upon a desert-land entry shows that the entryman has cultivated and irrigated at least one-eighth of the land, and has constructed ditches, owns a sufficient water right, has brought water to the land, and is prepared to turn water upon the entire tract when it shall have been cleared and prepared for cultivation, he is not required to show further that water has actually been distributed over all the irrigable land in the entry.

Directions given for amendment of the circular of November 30, 1908, 37 L. D. 312, to accord with the views herein expressed.

DESERT LAND ENTRY—CONTEST—CHARGE OF FRAUD—ANNUAL EXPENDITURES. WILLIAMS v. KIRK, FEBRUARY 7, 1910.

The fact that the annual expenditures for the benefit of a desert-land entry are made by another, for the entrymen, is not sufficient ground for contest, if made in good faith to effect reclamation, and not with a view to indirectly obtaining title to the land.

It is not of itself evidence of fraud, or ground for contest, that a group of desert-land entrymen agree voluntarily to subject their lands to the support of an irrigation system from which water may be taken for their reclamation.

DESERT LAND ENTRY—ASSIGNMENT—CONTEST—ACT OF MARCH 26, 1908. HARRINGTON v. PATTERSON, FEBRUARY 8, 1910.

The desert-land right under the acts of March 3, 1877, and March 3, 1891, is exhausted by either making or taking by assignment an entry for 320 acres.

Where one who had exhausted his right by taking an entry by assignment was nevertheless permitted to make another entry in his own name, it may be permitted to stand if within the provisions of the act of March 26, 1908, authorizing second desert entries, notwithstanding a pending contest charging disqualification at the time the entry was made.

(Continued from page 304.)

The New York Experiment Station recommends that spraying be commenced when the plants are six to eight inches high and repeat the treatment at intervals of 10 to 14 days in order to keep the plants well covered with Bordeaux throughout the season. During epidemics of blight, it may be necessary to spray as often as once a week. Usually six applications will be required. The Bordeaux mixture should contain four pounds of copper sulphate to each 50 gallons in the first two sprayings and six pounds to 50 gallons in subsequent sprayings. Whenever bugs or flea beetles are plentiful, add one to two pounds of Paris green or two quarts of arsenite of soda stock solution to the quantity of Bordeaux required to spray an acre.

Thoroughness of application is to be desired at all times, but is especially important when flea beetles are numerous or the weather favorable to blight. Using the same quantity of Bordeaux, frequent light applications are likely to be more effective than heavier applications made at long intervals, e. g., when a horse sprayer carrying but one nozzle per row is used, it is better to go over the plants once a week than to make a double spraying once in two weeks. A good plan is to use one nozzle per row in the early sprayings and two nozzles per row in the later ones.

To get along with three sprayings only, the first one should be postponed until there is danger of injury from bugs or flea beetles and then spray thoroughly with the Bordeaux and poison. The other two sprayings should likewise be thorough and applied at such times as to keep the foliage protected as much as possible during the remainder of the season. Very satisfactory results may be obtained from three thorough sprayings.

(Continued on page 329.)

U. S. Reclamation Record.

(Under this caption we will present to our readers, from month to month, or as its importance may warrant it, a digest of the latest developments in connection with the United States Reclamation Service, including "Public Notices" and "Service Orders" of public interest.)

"SERVICE ORDERS."**Water-Right Applications for Lands in Private Ownership.**

Under date of November 20, 1909, the Department ruled that an applicant for water-rights for land in private ownership, having the necessary qualifications, may, after having disposed of a previously acquired water-right, make another application, and as to that, may be considered in the position of an original applicant; and that a land-owner may be the purchaser of the use of water for separate tracts at the same time, providing he can properly qualify, and that the tracts involved do not exceed 160 acres of irrigable land in the aggregate.

Functions of the Chicago Office.

Under date of January 14, the Department ordered that the functions of the Chicago office be confined:

- (a) To transportation matters in general, as they now constitute the work of the office.
- (b) To the purchasing of such supplies and materials as in the opinion of the supervising and project engineers could be secured through the said office at a saving to the government. In this connection, the facilities of the Chicago office should be utilized whenever possible.
- (c) To the expediting of shipments of supplies and materials and related matters.
- (d) That the settlement work of the Service, in so far as the same is handled at Chicago, should be under the entire supervision of the Washington office.

Water-Rights for Lands in Joint Ownership.

On January 12, 1910, the Department ruled that where a tract of land under a reclamation project is owned by two or more persons jointly, unless each is a "resident" or an occupant on the land, as provided in Section 5 of the reclamation act, no right to use water to irrigate the same can be acquired thereunder.

Engineering Contracts and Inspection.

The work heretofore carried on by the Chicago office in connection with issuing specifications and opening proposals for contracts and the inspection of material, machinery, etc., on engineering contracts will hereafter be performed in the office of the Director.

When specifications for work of this character are forwarded from the field they should be submitted sufficiently in advance to permit of review before being issued. When mimeograph copies of such specifications are prepared in the field, a sufficient number should be forwarded to provide for sending to bidders and also for use in making extra copies of contracts for the Director's and field offices where needed. This order does not apply to the purchase and inspection of materials for immediate delivery, which will still be handled by the Chicago office.

PUBLIC NOTICES.**Idaho, Minidoka Project.**

On February 7, 1910, public notice was issued in connection with the Minidoka Project, Idaho, in regard to lands above the grade of gravity distribution, for which, under existing notice and orders, the first installment of the charges will become due December 1, 1910.

Water will not be available in 1910 for the high areas of many of the farm units, and in order to provide for a more equitable apportionment of the charges, it is announced that township plats will be filed in the local land office as soon as practicable, showing separately for each farm unit the acreage irrigable by gravity and the high-land acreage irrigable by pumping or otherwise.

(Continued on page 330.)

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Department of Agriculture— Latest Publications.

[To obtain those publications to which a price is affixed, application must be made to the **Superintendent of Documents, Government Printing Office, Washington, D. C.**, to whom all remittances must be directed. **Stamps and personal checks will not be accepted.**

The Superintendent of Documents is not an official of the Department of Agriculture.

Publications for free distributions i. e., those to which no price is attached, may be obtained upon application to the Secretary of Agriculture, Washington, D. C. **Free publications are not distributed by the Superintendent of Documents.** In all cases where officials desire to exchange publications applications should be made to the Department of Agriculture.

The Department of Agriculture **does not distribute nor control the distribution of publications of the State Agricultural Experiment Stations.** Application for them should be made to the several stations in the different States.

A List of Publications for free distribution revised to October 15, 1909, and a separate list of publications for sale (by the Superintendent of Documents) revised to October 1, 1909, may be procured free of charge upon application to the Secretary of Agriculture, Washington, D. C.

The list appended includes all publications of general interest and value issued since the revision of these lists.]

SOIL SURVEY OF THE PORTERSVILLE AREA, CALIFORNIA. By A. T. Strahorn, L. C. Holmes and C. W. Mann. Pp. 40, fig. 1, map.

BULLETINS.

DECIDUOUS FRUIT INSECTS AND INSECTICIDES. By H. F. Wilson, Engaged in Deciduous Fruit Insect Investigations. Pp. 117, pls. 11, figs. 20 (Bulletin 68, Bureau of Entomology). Price 25 cents.

WOOD PRESERVATION IN THE UNITED STATES. By W. F. Sherfesse, in Charge of Wood Preservation. Pp. 31, pls. 4, figs. 3. (Bulletin 78, Forest Service.) Price 10 cents.

CIRCULARS.

DIPPING TWICE OF SHEEP IMPORTED FROM MEXICO FOR BREEDING, GRAZING OR FEEDING. Amendment to regulation 49. P. 1. (Amendment 8 to B. A. I. Order 142.)

REPRINTS.

EDUCATION FOR COUNTRY LIFE. Circular 84, Office of Experiment Stations. Price, 5 cents.

PRESERVATIVE TREATMENT OF FENCE POSTS. Circular 117, Forest Service.

THE FUTURE USE OF LAND IN THE UNITED STATES. Circular 159, Forest Service.

DRY-LAND GRAINS. Circular 12, Bureau of Plant Industry.

DUST PREVENTION, ROAD PRESERVATION AND ROAD CONSTRUCTION. Circular 90, Office of Public Roads. Progress Reports of Experiments.

HOG CHOLERA. By M. Dorset, Chief Biochemic Division, Bureau of Animal Industry. Pp. 25. Figs. 3. (Farmers' Bulletin 379.) This Bulletin is intended to supersede Farmers' Bulletin 24 on the same subject, and contains information as to the cause and symptoms of hog cholera, describes diseases which may be mistaken for hog cholera and gives directions for the prevention and treatment of the disease by the use of serum.

LOCO-WEED DISEASE. By C. Dwight Marsh, Expert, Poisonous Plant of Investigations, Bureau of Plant Industry. Pp. 16, figs. 4. (Farmers Bulletin 380.) This Bulletin describes the plants known as loco weeds, the manner and symptoms of poisoning of horses, cattle and sheep, and the post-mortem appearances of poisoned animals. It contains directions for the treatment of affected animals, destruction of the weeds, etc.

REPRINTS.

RELATION OF SUGAR BEETS TO GENERAL FARMING. 320, Yearbook, 1903.

OPPORTUNITIES IN AGRICULTURE. 340, Yearbook, 1904.

ANNUAL LOSS OCCASIONED BY DESTRUCTIVE INSECTS IN THE UNITED STATES. 360, Yearbook, 1904.

NATIONAL FORESTS AND THE LUMBER SUPPLY. 434, Yearbook, 1906.

CODLING MOTH OR APPLE WORM. 460, Yearbook, 1907.

WASTES OF THE FARM. 475, Yearbook, 1908.

SPRAYING FOR ORCHARD INSECTS. 480, Yearbook, 1908.

SO-CALLED CHANGE OF CLIMATE IN THE SEMIARID WEST. 481, Yearbook, 1908.

INSTRUMENTS FOR MAKING WEATHER OBSERVATIONS ON THE FARM. 492, Yearbook, 1908.

SOIL MULCHES FOR CHECKING EVAPORATIONS. 495, Yearbook, 1908.

ADVANCE SHEETS SOIL SURVEY.

SOIL SURVEY OF THE MODESTO-TURLOCK AREA, CALIFORNIA, with a Brief Report on a Reconnaissance Soil Survey of the Region East of the Area. By A. T. Sweet, J. F. Warner and L. C. Holmes. Pp. 70, pl. 1, figs. 2, map.

SOIL SURVEY OF RICHLAND COUNTY, NORTH DAKOTA. By Frank Bennett, E. L. Worthen, Rec. E. Willard, and E. B. Watson. Pp. 38, fig. 1, map.

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REPORTS.

ANIMAL INDUSTRY. Report of the Chief of the Bureau for 1909. By A. D. Melvin. Pp. 69.
 BIOLOGICAL SURVEY. Report of the Chief of the Bureau for 1909. By C. Hart Merriam. Pp. 23.
 EXPERIMENT STATIONS. Report of the Director of the Office for 1909. By A. C. True. Pp. 31.
 PLANT INDUSTRY. Report of the Chief of the Bureau for 1909. By B. T. Galloway. Pp. 118.

BULLETINS.

APPLICATION OF SOME OF THE PRINCIPLES OF HEREDITY TO PLANT BREEDING. By W. J. Spillman, Agriculturist in Charge of the Office of Farm Management. Pp. 74, figs. 6. (Bulletin 165, Bureau of Plant Industry.) Price, 10 cents.
 FOREIGN TRADE OF THE UNITED STATES IN FOREST PRODUCTS, 1851-1908. Pp. 32. (Bulletin 51, Bureau of Statistics.) Price, 5 cents.

REPRINTS.

UNFERMENTED APPLE JUICE. Bulletin 118, Bureau of Chemistry. Price, 5 cents.

CIRCULARS.

TO PREVENT THE SPREAD OF SPLENETIC FEVER IN CATTLE. Rule 1, Revision 5, to B. A. I. Order 166. Pp. 10. (Bureau of Animal Industry.)
 FORESTS OF THE UNITED STATES: THEIR USE. By Overton W. Price, Associate Forester, and R. S. Kellogg and W. T. Cox, Assistant Foresters. Pp. 25. (Circular 171, Forest Service.)
 METHODS OF INCREASING FOREST PRODUCTIVITY. By E. E. Carter, Assistant Forester. Pp. 16. (Circular 172, Forest Service.)
 LIMITATION OF THE SATSUMA ORANGE TO TRIFOLIATE ORANGE STOCK. By Walter T. Swingle, Physiologist in Charge of Crop Physiology and Breeding Investigations. (Circular 46, Bureau of Plant Industry.)

REPRINTS.

BLACKLEG: ITS NATURE, CAUSE AND PREVENTION. Circular 31, revised, Bureau of Animal Industry.
 PREPARATION OF EMULSIONS OF CRUDE PETROLEUM. Circular 89, Bureau of Animal Industry.
 RECORDS OF DAIRY COWS: THEIR VALUE AND IMPORTANCE IN ECONOMIC MILK PRODUCTION. Circular 103, Bureau of Animal Industry.
 FEDERAL MEAT INSPECTION SERVICE. Circular 125, Bureau of Animal Industry.
 THE PEACH TREE BORER. Circular 54, Division of Entomology.
 REQUIREMENTS TO BE COMPLIED WITH BY NURSERMEN OR OTHERS WHO MAKE INTERSTATE SHIPMENTS OF NURSERY STOCK. Circular 75, Bureau of Entomology.
 HARLEQUIN CABBAGE BUG. Circular 103, Bureau of Entomology.
 NATURAL REVEGETATION OF DEPLETED MOUNTAIN GRAZING LANDS. Circular 169, Forest Service.

FARMERS' BULLETIN.

ADULTERATION OF FORAGE-PLANT SEEDS. By F. H. Hillman, Assistant Botanist, Seed Laboratory, Bureau of Plant Industry. Pp. 23, figs. 19 (Farmers' Bulletin 382). This bulletin explains the nature and forms of adulteration of seeds, the results of such adulteration, and describes the kinds of forage-plant seeds commonly adulterated and the seeds used as adulteration.

HOW BIRDS AFFECT THE ORCHARD. Separate 197, Yearbook, 1900.

CULTIVATION AND FERTILIZATION OF PEACH ORCHARDS. Separate 293, Yearbook, 1902.

REPORT OF THE SECRETARY OF AGRICULTURE, 1909. Pp. 100. Price, 10 cents.

REPORT OF THE FORESTER FOR 1909. By Gifford Pinchot. Pp. 45.

MANUFACTURE OF DENATURED ALCOHOL. Pp. 166, figs. 15. Price, 20 cents.

NORTH AMERICAN ENTOMOLOGY. A List of Works. By Nathan Banks, Assistant Bureau of Entomology. Price, 15 cents.

GIPLY MOTH PARASITE. Technical Results from the Laboratory. By L. O. Howard. Pp. 12, figs. 7. Price, 5 cents.

IRRIGATION IN TEXAS. By J. C. Nagle, Professor of Civil Engineering, Texas. Prepared under the direction of Samuel Fortier. Pp. 92, pl. 1, Bulletin 222, Office of Experiment Station. Price, 15 cents.

EXPERIMENT STATION RECORD, published monthly. The Record contains numerous abstracts of the publications of the agricultural experiment stations and kindred institutions in this and other countries, articles and editorials on topics of special interest in agricultural science by American and foreign experts, and notes on the experiment stations.

Note.—For the convenience of those who desire to receive this publication regularly, the Superintendent of Documents has fixed the price of this serial, which is now issued in two volumes a year, eight numbers each, at \$1.00 per volume, payable in advance. Current numbers are not sold separately.

REFERENCE LIST OF THE ELECTRIC FIXATION OF ATMOSPHERE NITROGEN AND THE USE OF CALCIUM CYANAMID AND CALCIUM NITRIDE ON SOILS. Compiled by Stephen Conrad Stuntz. Pp. 89. (Bulletin 63, Bureau of Soils.) Price, 10 cents.

DRINAGE OF IRRIGATED LANDS IN THE SAN JOAQUIN VALLEY, CALIFORNIA. Bulletin 217, Office of Experiment Station. Price, 15 cents.

CIRCULARS.

TO PREVENT THE SPREAD OF SCABIES IN CATTLE. Rule 2, Revision 3. Pp. 3. (Order 167, Bureau of Animal Industry.)

DRAINAGE INVESTIGATIONS, ORGANIZATION WORK AND PUBLICATIONS. Pp. 6. (Circular 88, revised, Office of Experiment Stations.)

SUPPLEMENTAL IRRIGATION WITH SMALL WATER SUPPLIES AT CHEYENNE AND NEWCASTLE, WYOMING, 1905-1908. Progress Report on Experiments. By O. W. Bryant, Irrigation Manager in Charge of Work in Colorado and Wyoming. Prepared under the direction of Samuel Fortier. Pp. 51, figs. 8. (Circular 93, Office of Experiment Stations.)

FARM EQUIPMENT—MINOR ARTICLES. By L. W. Ellis, Assistant Office of Farm Management. Pp. 15. (Circular 44, Bureau of Plant Industry.)

CROP REPORTER, published monthly. (Bureau of Statistics.) The Crop Reporter is a two-column quarto publication devoted to agricultural statistics.

DISEASES OF THE STOMACH AND BOWELS OF CATTLE. Circular 68, revised, Bureau of Animal Industry.

THE WHITE ANT. Circular 50, Second Series, Bureau of Entomology.

MITES AND LICE ON POULTRY. Circular 92, Bureau of Entomology.

THE TEACHING OF AGRICULTURE IN THE RURAL COMMON SCHOOLS. Circular 60, Office of Experiment Stations.

IMPROVEMENT OF THE OAT CROP. Circular 30, Bureau of Plant Industry.

DECAY OF CABBAGE IN STORAGE—ITS CAUSE AND PREVENTION. Circular 39, Bureau of Plant Industry.

FARMERS' BULLETINS.

HOW TO DESTROY ENGLISH SPARROWS. By Ned Dearborn, Assistant Biological Survey. Pp. 11, figs. 4. (Farmers' Bulletin 383.)

POTATO CULTURE ON IRRIGATED FARMS OF THE WEST. By E. H. Grubb, of Colorado. Pp. 15, figs. 3. (Farmers' Bulletin 386.) This bulletin gives directions for the preparation of the soil for the potato crop, the planting, cultivation, irrigation, etc., and contains suggestions for storing, marketing, and seed selection, with remarks on varieties and yields.

FROM YEARBOOKS OF DEPARTMENT OF AGRICULTURE.

TOP WORKING ORCHARD TREES. Separate 266, Yearbook, 1902.

USE OF ILLUSTRATIVE MATERIAL IN TEACHING AGRICULTURE IN RURAL SCHOOLS. Separate 382, Yearbook, 1905.

WASTES OF THE FARM. Separate 475, Yearbook, 1908.

RELATIONS BETWEEN BIRDS AND INSECTS. Separate 486, Yearbook, 1908.

BY-PRODUCTS OF THE SUGAR BEET AND THEIR USES. Separate 493, Yearbook, 1908.

DEVELOPMENT OF FARM CROPS RESISTANT TO DISEASE. Separate 494, Yearbook, 1908.

SOIL SURVEY OF THE PAJARO VALLEY, CALIFORNIA. By W. W. Mackie. Pp. 46, fig. 1, map.

SOIL SURVEY OF THE KLAMATH RECLAMATION PROJECT, OREGON. By A. T. Sweet and I. G. McBeth. Pp. 45, pl. 1, fig. 1, map.

BULLETINS.

ORGANIZATION LISTS OF THE AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS IN THE UNITED STATES. Pp. 93. (Bulletin 224, Office of Experiment Stations.) Price, 10 cents.

VARIETIES OF AMERICAN UPLAND COTTON. By Frederick J. Tyler. Pp. 127, pls. 8, figs. 67. (Bulletin 163, Bureau of Plant Industry.) Price, 25 cents.

MISTLETOE PEST IN THE SOUTHWEST. By William L. Bray. Pp. 39, pls. 2, figs. 7. (Bulletin 166, Bureau of Plant Industry.) Price, 10 cents.

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VARIETIES OF ALFALFA. By J. M. Westgate. Pp. 63, pls. 9, figs. 5. (Bulletin 169, Bureau of Plant Industry.) Price, 10 cents.

IMPORTS OF FARM PRODUCTS INTO THE UNITED STATES, 1851-1909. Pp. 62. (Bulletin 74, Bureau of Statistics.) Price, 10 cents.

EXPORTS OF FARM PRODUCTS FROM THE UNITED STATES, 1851-1908. Pp. 66. (Bulletin 75, Bureau of Statistics.) Price, 10 cents.

CIRCULARS.

ADULTERATION AND MISBRANDING OF THE SEEDS OF ALFALFA, RED CLOVER, ORCHARD GRASS AND KENTUCKY BLUEGRASS. Pp. 4. (Circular 31, Office of the Secretary.)

VALUE OF PEACHES AS VINEGAR STOCK. By H. C. Gore, Assistant Chemist Division of Foods. Pp. 7. (Circular 51, Bureau of Chemistry.)

LIST OF PUBLICATIONS OF THE BUREAU OF ENTOMOLOGY. Compiled by Mabel Colcord, Librarian. Pp. 32. (Circular 51, Bureau of Chemistry.)

THE WESTERN GRASS-STEM SAWFLY (*Cephus occidentalis* Riley and Marlatt). By F. M. Webster, in charge of Cereal and Forage Insect Investigations; and George I. Reeves, Special Field Agent. Pp. 6, fig. 1. (Circular 117, Bureau of Entomology.)

ORGANIZATION WORK AND PUBLICATIONS OF IRRIGATION INVESTIGATIONS. Pp. 12. (Circular 87, Office of Experiment Stations.)

(Continued on page 337.)

Recent Legal Decisions on Irrigation and Related Rights

CONSTITUTIONALLY LIMITED AND ASSURED WATER RIGHTS—POSITION OF APPROPRIATOR—MEASURE OF RIGHTS—VALIDITY OF CONTRACT, PREFERENTIAL AND PERMANENT RIGHTS.

The supreme court of California says, in *Leavitt vs. Lassen Irrigation Co.*, 106 Pacific Reporter, 404, that, for the plaintiff, the most favorable view which could be taken of the evidence was that he made an appropriation of waters for the public use of sale, rental, and distribution under the constitution of 1879; that by means of the same canal and ditches he made a private appropriation of waters for use upon his individual land; and that when he came to sell his irrigating system he withheld from the sale the waters so privately appropriated. It could not be said that there was anything illegal in these acts.

But, treating *Leavitt's* appropriation as being wholly and entirely for public use, he, the owner of the system, was but an instrumentality for the distribution of the waters which he gathered to such members of the public as might apply for them and pay to him the legal charge for the service that he rendered. As the agent of such a public use, he had no power whatsoever to reserve to himself for his private purposes any part of this water. If he could reserve a part, he could reserve all, and thus, by his ipse dixit (he himself has said), convert a public use into private ownership, or, if he could reserve a part for himself, he could with equal authority give away parts of the supply to others, and by this method destroy what the constitution itself has declared shall remain forever a public use.

Therefore the only tenable ground upon which he could stand would be that, with his appropriation for public use, he became a private appropriator of water upon his ranch. If this was so, then his rights to water would be measured as are the rights of every other private appropriator—not by the amount which he took, not by the amount which he claimed, not by an amount sufficient thoroughly and properly to irrigate a thousand acres of land; but it would be measured by the amount which he had been actually taking and applying to a beneficial use upon that land. His right to priority in the use of water would also be measured by and limited to this quantity.

Another question was: Can a corporation, which has appropriated water which the constitution has declared shall forever be devoted to a public use, contract with A., B., and C. to supply them in perpetuity with a given quantity of water, and then, by assigning in turn to A., B., and C. its rights under these contracts, confer upon A., B., and C. a private right superior to and destructive of the public use? If this may be done with one, it may be done with many, and water which has thus been appropriated for public rental, distribution, and sale may, by this legerdemain of the law, be transferred into private ownership and use. This may not be done.

The fundamental and all-important proposition then is this: That a public service water company which is appropriating water under the constitution of 1879, for purposes of rental, distribution, and sale, cannot confer upon a consumer any preferential right to the use of any part of its water. All are equally entitled to share in the use of the water who pay, or offer to pay, the legal rate and to abide by the reasonable rules and regulations of the company.

It does not follow that a water company may not make specific contracts with individual consumers which are within the purview of the constitution and within valid legislative enactments regulating the public use. This is precisely as decided by *Fresno Canal Co. vs. Park*, 129 Cal. 437. But, as decided in *Crow vs. San Joaquin Irrigation Co.*, 130 Cal. 309, immediately following the *Park Case*, such a contract, even if violated by the consumer, could not operate to deprive him of his constitutional right to the water furnished by the public service corporation upon tender to it of the legal rate. For the breach of the consumer's contract, the water company must seek other redress than that of depriving the consumer of his share of the supply.

The foregoing statement that a water company, or person in charge of water devoted to public use, cannot confer a preferential right upon one consumer over another, is not to be understood as denying the right of such company or person in possession of a limited amount of water to devote that amount to the irrigation of a given area of land. The court is not to be understood as saying that the company may not fix the limits of this territory, and lawfully agree to supply its waters, first, to the lands within that territory, and to supply to outsiders only such surplus as there may be after the needs of the original territory for which the water was procured are satisfied. This would not be in derogation of the public trust, but would be a mere regulation of use in the performance of the trust.

Permanent rights, in a limited sense, consumers may acquire. That is to say, having once been supplied by the company, they are entitled to a continuation of such supply, unless their amount shall be diminished by a shortage for which the water company is not responsible, or a shortage by reason of the increased demand of added consumers. In such cases the duty of the water company is to supply such water as it has, fairly apportioned between its consumers. If it be conceived that section 552 of the civil code is designed to confer upon any particular consumer any special, permanent, and preferential right above what is here stated, that effort, being plainly violative of the constitution, would be

held void. The same declaration applies to the provision of the act entitled "An act to regulate and control the sale, rental and distribution of appropriated waters in this state other than in any city," etc., approved March 12, 1889, and the amendment to that act approved March 2, 1897.

In this case there was no refusal on the part of the company to furnish water. The plaintiff was tendered the water—first, at the rate fixed by law, and, second, at the rate fixed by a contract assigned to him. But he refused to pay anything for the water, and insisted upon his right to take it and use it without charge. This right he did not have. The utmost for which he could contend was the right to the use of water (in consonance with the foregoing principles) upon the tender of payment of the contract rate. His conduct was an intentional breach and repudiation by which, whatever it may have been conceived they were, his rights under the contract came to an end.

VALIDITY AND CONSTRUCTION OF GRANT OF "FREE AND PERPETUAL USE OF WATER."

Where a landowner conveys a tract of land lying under his canal and susceptible of irrigation therefrom, and includes in the conveyance a grant of the "free and perpetual use of water" from the grantor's canal sufficient to irrigate the land conveyed, the supreme court of Idaho holds, *Nampa & Meridian Irrigation District vs. Gess*, 106 Pacific Reporter, 993, that the grant of such free and perpetual water right does not obligate the grantor or his successors or assigns to perpetually bear and pay the expense and cost of maintaining and protecting the canal and the water right and delivering the water to the consumer. In such a case the contract conveys a free and unincumbered right and title in and to the waters of the canal, and carries with it an unqualified right to the extent of the quantity of water conveyed in the appropriation itself and the right to have the water flow through the canal, and the grantor perpetually abandons and foregoes the right to ever thereafter charge, collect or realize any profit or rental for the use of the water conveyed.

The court has no doubt but that the grantee acquired his right and interest in the appropriation of the volume of water which was carried through the canal, and that he might, at any time the majority owners of the canal failed or neglected to protect the appropriation and keep the canal in repair, go himself upon the property, protect the appropriation, maintain the diversion, and carry the water through the canal to the extent of the quantity necessary for the irrigation of his tract of land. In such a case, the actual expense of maintenance and delivery to the extent of his use would fall upon him, but he would be liable to no one for water rentals.

If a contract of this kind is to be held valid, it must rest upon the assumption that the ditch company originally received a sufficient consideration for the contract to justify it perpetually thereafter abandoning and foregoing the right to realize a profit or rental for the delivery of the quantity of water sold under the contract. Such an assumption is by no means unreasonable or illogical. A canal company at a time of financial need might receive a sufficient consideration for a perpetual water right that the annual income from such consideration would equal the annual water rates that might thereafter be established in conformity with law. The company cannot, however, sell and dispose of free water rights, and thereafter claim a sufficient water rate from other consumers to pay it a profit on the free water rights thus disposed of. That is the question specifically determined and passed upon by the federal court in the case of *Boise City Irrigation & Land Co. vs. Clark*, 131 Fed. 415.

TIME FOR COMPLETION OF DITCH AND ATTACHMENT OF RIGHTS—MEASURE AND LIMIT OF WATER RIGHTS—QUANTITY AND MEASUREMENT OF WATER REQUIRED FOR PROPER IRRIGATION.

The supreme court of Oregon says, in the case of *Whited and others vs. Cavin and others*, 105 Pacific Reporter, 396, brought to determine the right, as between the plaintiffs and the defendants, to the use of the waters of the south fork of Burnt river in Baker county, that arrangements were made in 1883 whereby the plaintiffs joined in the enlargement of the ditch begun by *Whited* in 1881, and the work of enlarging and extending it, to cover their lands, was diligently prosecuted until its completion, which was accomplished within four years from the commencement thereof. This, the court believes, in view of the difficulties encountered in its construction and other circumstances disclosed by the record, was within a reasonable time. Under such circumstances, by the well-settled rule in Oregon, the plaintiffs' rights related back to the commencement of their work in 1883 and *Whited's* rights attached at an earlier period.

The next point was that, taking all of the testimony into consideration, it was reasonably safe to infer that the carrying capacity of the *Wham-Whited* Upper ditch had, since 1887, been increased about 30 per cent, and that, at the time of the location of the appealing defendants' water rights, it was about 10 second feet, or 400 inches, which, the supreme court finds, was the quantity to which the plaintiffs, as against all the defendants, are entitled, west of the channel of the creek and below the *Wham-Whited* Upper ditch for a sufficient time during each irrigation season to properly irrigate their lands.

Other points, of general interest, decided are: That a change in the point of diversion and place of use may be made when it can be done without prejudice to the rights of others.

Any person or number of persons may have an interest in or become the exclusive owner or owners of, different water rights, each of which may have had their inception at different times, and in such cases the order of their respective

priorities must necessarily depend upon the dates of the initiation of each particular right.

The right to water, claimed by prior appropriators for irrigation purposes, is always limited in quantity by the use for which the appropriation is made, and to which it may, in a reasonable time, be applied, and it is so well settled as almost to become axiomatic that beneficial use and the needs of the appropriators, and not the capacity of the ditches, or quantity first run through them, is the measure and limit of the appropriators. While the quantity to which the appropriators may be entitled does not necessarily equal the carrying capacity of the ditch, the capacity thereof is essentially the utmost limit of such right. Measured by this rule, the plaintiffs, as first appropriators, were limited to the capacity of the ditch, which at the inception of the defendants' rights did not exceed 400 inches, and to the use of water sufficient only for the proper irrigation of a quantity of lands not exceeding the acreage between the ditch and the stream from which diverted.

Nearly all the witnesses placed the quantity required for the proper irrigation of lands in that vicinity at one inch per acre, though one witness gave it as his opinion that it requires as high as 17 inches per acre for the proper irrigation of some lands. It is obvious, that a flow of 17 inches of water per acre is never required for the irrigation of any lands, even though it should be but one acre, unless in some exceptional localities, where the soil may contain so much gravel or be so porous as to make its use unprofitable for cultivation. The sincerity of the witness serves only to illustrate the general lack of knowledge, even among water users, concerning the quantity of water furnished by a constant flow of one inch, miner's measurement, and the corresponding unreliability of testimony of the character adduced on the subject, amounting merely to an opinion or guess without any actual test as to the quantity actually used and required.

One inch of water, under six-inch pressure, miner's measurement, is 1-40 of a second foot, and furnishes a flow of 675 gallons per hour, which in 30 days would furnish 1½ acre feet, or 6 acre feet of water for a 4 months' irrigation period. A flow of 17 inches therefore would cover an area, equal to one acre, to a depth of 25¼ feet each month or 102 feet in depth (102 acre feet), during and irrigation season of four months. The absurdity of such a quantity being essential to the proper irrigation of lands is manifest. Four hundred inches of constant flow would cover an area equal to 440 acres, during a like period, 5½ feet in depth. The quantity allowed by the government for an irrigation season in similar localities and altitudes, with like soil, is usually about 1½ acre feet. It is clear therefore that 10 second feet, or 400 inches, are ample for the irrigation of the plaintiffs' lands under the ditch, and it is probable that even this quantity is not required at all times during the irrigation seasons. When not so required, it becomes subject to use by others on the stream, in the order of their rights.

As the plaintiffs rely for their water rights on the diversion made through the Wham-Whited Upper ditch, they are limited in their use, under this appropriation, to the lands under that ditch, which may be irrigated by water diverted either through that canal or other ditches under it; and, while not necessarily confined to the same specific tracts upon which the appropriation was perfected at the time of the inception of the water rights of the answering defendants, which did not exceed 440 acres.

It may be regarded as well in Oregon that it is only necessary to the maintenance of suits of this character, either that it appear that the defendants claim adversely to the moving party, or, if not asserting a hostile claim, that those made defendants are necessary to a complete determination of the controversy.

Supreme Court Decisions

Irrigation Cases

RIGHT TO RECOVER DAMAGES FOR DELAY IN FURNISHING PLANT.—

Where a buyer of an irrigation plant accepted the plant when completed, and stated in writing that it was erected according to the contract, and he procured an extension of the note for the price, based on his waiver of all damages, he could not recover damages for the seller's failure to deliver the plant in time.—*Fairbanks Co. v. Stites*. Court of Civil Appeals of Texas. 125 Southwestern 636.

REPUDIATION OF CONTRACT.—

Where a water company tenders water to a consumer, first at the rate fixed by law, and next at the rate fixed by a contract, and the consumer refuses to pay anything, and claims the right to use it without charge, this amounts to a repudiation, by which any rights of his under the contract are ended.—*Leavitt v. Lassen Irrigation Co.* Supreme Court of California. 106 Pacific 404.

POLLUTION OF STREAM.—

Where defendant, in the operation of its concentrating mill, with a comparatively small expenditure could take care of the tailings on its own premises instead of discharging

them into a stream from which plaintiff had appropriated waters for irrigation, defendant was not entitled to continue such discharge on the ground that its mill was absolutely dependent on the right to discharge its waste material into the stream.—*Humphreys Tunnel & Mining Co. v. Frank*. Supreme Court of Colorado. 105 Pacific 1093.

RIGHTS OF RIPARIAN OWNER.—

Each riparian owner is entitled to a reasonable use of the waters as an incident to his ownership; his right to be consistent with the rights of the others.—*McEvoy v. Taylor*. Supreme Court of Washington. 105 Pacific 851.

CHANGE IN POINT OF DIVERSION.—

An appropriator of water for irrigation may not change the point of diversion, the character or place of use, or enlarge the same to the injury of other appropriators, but, with this qualification, the right to do so is a vested property right, which attaches to the appropriation, and may be made at the will of the appropriator.—*Dies v. Hartbauer*. Supreme Court of Colorado. 105 Pacific 868.

CHANGE IN POINT OF DIVERSION.—

A change in the point of diversion of water for irrigation and place of use may be made when it can be done without prejudice to the rights of others.—*Whited v. Cavin*. Supreme Court of Oregon. 105 Pacific 396.

CONSTRUCTIVE TRUST IN IRRIGATION PROJECT.—

Decedent posted notices of appropriation of water intending to acquire the C. canal, a partly completed irrigation canal, for use of distributing the water appropriated. Being without sufficient means, he interested defendants; it being agreed that a corporation should be formed to carry on the enterprise. Decedent conveyed all his rights to defendants in trust, to be conveyed by them to the corporation on its formation. The contemplated corporation was not organized, and defendants, to defraud decedent, organized another corporation and acquired independent rights, including a lease of the canal. One of defendants and the corporation posted notices of appropriation at substantially the same place where decedent posted his. Decedent's administrator sues to establish a trust in the property, for an accounting, etc. *Held*, that he could show that the corporation excavated a canal extending from where its notice was posted to the upper end of the C. canal and completed the C. canal; that the C. canal district owned a strip of land extending from the upper end of the canal to the river, and covering decedent's water location, as well as the later locations by defendants and the corporation, and that the land was included in the lease; that one of defendants, when negotiating for the lease, said that he could and would acquire decedent's right for use in connection with the canal, and that those rights were necessary to the scheme he proposed to carry out because they were superior to the right of the irrigation district, and that he intended to post new notices of appropriation to protect those rights, and the administrator could also show the extent and value of the C. canal, notice to the corporation of decedent's rights and of his interest in common with the defendants, and the time elapsed since the district had done any work under its irrigation scheme or toward the completion of the canal; that the corporation paid the rent reserved in the lease; and that the line of the proposed canal described in decedent's appropriation notices was identical with the line of the C. canal.—*Beckwith v. Sheldon*. Supreme Court of California. 97 Pacific 867.

Water flowing in a well-defined water course, whether swale or creek in its primitive condition, may not, except in the exercise of the power of eminent domain, lawfully be diverted and cast upon lands of an adjoining proprietor, where it was not wont to run according to natural drainage.—*Kane v. Bowden*. Supreme Court of Nebraska. 123 Northwestern 94.

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Reclamation Notes

CALIFORNIA.

Work on the new reservoir in Orchard Dale, which, when completed, will hold enough water to irrigate 400 acres of land at one time, is rapidly being pushed to completion.

An extension of sixty days has been granted to Mr. Anson B. Munson, of Orland, Cal., within which to complete his contract on the Orland irrigation project. The date of completion was set forward to June 29, 1910.

The Sacramento Valley Irrigation Company has purchased the holdings of the H. A. Logan Land and Stock Company, consisting of 1,120 acres west of Norman. Canals of the company will be extended to the lands purchased.

Plans are on foot among the trustees of Reclamation District No. 531, lying along King's River, north of Hanford, for an extension of the district from its present eastern boundary to the country road, six miles north of Hanford. If the plans are successful, about 200 acres will be added.

At a recent meeting of irrigators at Stockton, on April 18, resolutions were passed providing for a committee to promote favorable legislation at the next session to make irrigation bonds a safe investment for state, county and municipal funds. The question of state organization of irrigators was also discussed and met with unanimous approval.

It is announced that W. P. Sproesser, president of the Merchants' National Bank of Watertown, Wis., visited Willows recently and looked over the section owned by the Sacramento Valley Irrigation Company, with a view to purchasing bonds in the Glenn and Colusa County Irrigation project, which is being promoted by the Kuhns of Pittsburgh.

J. L. Slater, who recently purchased 16,250 acres, known as the Finnell lands, near Corning, for \$500,000, has filed on 20,000 inches of the water of Elder creek, Tehama county. A dam 15 feet high will be built in Elder creek. New York capitalists are said to be backing Mr. Slater, who is from Berkeley. It is said that litigation over water rights may develop before Mr. Slater can put his irrigation plan into execution.

A. Y. Davies and F. F. Moxley have ordered a gasoline engine and pump with which they will irrigate their land northwest of Laws. It is stated that water can be reached at a depth of twelve feet. There is a large tract of land near Laws which with irrigation will be productive and valuable. Messrs. Davies and F. F. Moxley are the first in the valley to undertake irrigation by pumping.

The question of whether the Turlock irrigation district shall issue bonds for the construction of a high line canal was discussed at a meeting of land owners at Cerezo on April 10. An election for this bond issue was held in 1908, with the result that the bond issue of \$100,000 was authorized and the bonds issued. Later it was decided that all of the proceedings were not in accordance with the law, and another petition was prepared and presented to the board, with the result that this last election was called. The proposed high line canal is intended to irrigate 20,000 acres.

At a meeting of the board of directors of the Halwood Irrigation district, held at Marysville recently, the engineer, having completed all preliminary surveys, was instructed to finish up the plans and specifications so that contract for digging the canal could be let. Water is to be diverted from the Yuba river at a point above Daguerro Point. The area to be brought under water is 10,000 acres, 4,000 of which is owned by the promoters of the enterprise. The canal will be twelve miles in length, eight feet on top, six feet on the bottom and three feet in depth. Among those interested in this project are Messrs. Dinsmore, M. Diggs, Thomas Matthews, F. D. Kroh and Byron Jakes.

OREGON.

The large Brogan reservoir for the Willow Creek project is now under construction by the Willow River Land & Irrigation Company.

Steps are now being taken to organize irrigation districts on the north side of the Malheur River, embracing about 60,000 acres of land tributary to Ontario, Vale and Weiser. A meeting of the land owners on the Dead Ox Flat was held recently, and committees were appointed to formulate plans.

Although Gilliam county has been considered a dry farming country, steps are now being taken to put about 3,000 acres of land under irrigation. Land in the Rock Creek valley has proved extremely valuable for raising alfalfa and fruit, but owing to the fact that Rock Creek goes dry each year, farmers feel that a more reliable and extensive system is necessary. A dam will be constructed at Devil's Gate, between perpendicular rock walls 150 feet high. The area of the basin is sufficient to irrigate many thousands of acres. The project will cost about \$60,000, which will be raised by issuing ten-year bonds, and assessing the land improved.

The Eschbach-Bruce Company of Seattle has been awarded the contract for the completion of the Furnish-Coe dam across the Umatilla, at a cost of \$65,000. The dam will be 50 feet high, 1,170 feet long, 270 feet wide at the base, and 20 feet wide at the top. It will form a reservoir covering 240 acres, and containing 8,000 acre feet of water. Upon completion of this dam the lands under the Furnish-Coe project will be supplied with water sufficient to irrigate them for 60 days, in addition to the usual amount obtained through original filings. The total cost of this work is \$110,000, as a sum nearly equal to the present contract has already been expended.

Federal Judge R. S. Bean has announced the appointment of C. R. Redfield as receiver for the Deschutes Irrigation & Power Company, which is constructing one of the most extensive projects in Crook county. The receiver was instructed to deposit a bond for \$100,000 and to make full accounting each month to the court. Mr. Redfield, as a reclamation engineer, has been connected with the company since its organization, and has been in full charge of all construction work. His appointment is satisfactory to both sides of the controversy. Operations of the company will be carried on as before and contracts which involve irrigation of about 14,000 acres will not be affected.

County commissioners held a meeting at Vale recently and established the boundaries of the Owyhee Irrigation district and set the date for the election of directors and ratification of the boundary lines. This district includes all the land from the Malheur river, which is the north line, south to the Owyhee river and west from Snake river to the High Line canal, 30 miles in length north and south, and from four to six miles in width from Snake river to the canal line, comprising with the Kingman Colony district, formed recently, 87,000 acres. This, with the Gem Irrigation District in Idaho, already organized, comprising 50,000 acres, will make nearly 137,000 acres to be irrigated by the High Line Canal from Owyhee river.

A report from the supervising engineer in charge of the government's Umatilla irrigation project states that the Cold Springs reservoir now contains about 40,000 acre feet of water. The maximum quantity carried last year was 27,000 acre feet. It is proposed to fill the reservoir to a capacity of 43,000 or 44,000 acre feet. The entire system is in a satisfactory working condition and settlement is proceeding rapidly. These lands are being sold in tracts of 20 to 40 acres at \$200 per acre and upwards. The government has expended to date about \$1,250,000 on this project. The aggregate value of the land under the project is estimated at \$5,000,000. The gross value of the project, including lands, rights, irrigation works, buildings and other improvements, is probably about \$7,000,000.

WASHINGTON.

Forty miles of sub-laterals to water 9,200 acres of land on the second unit of the Tieton project in the Yakima valley, west of Spokane, will be built by the government this season, to be completed in time for use early next spring.

The Northern Pacific Irrigation Company has completed the second unit of its project near Kennewick, and has 5,000 acres of land under the ditch.

It is understood that the Lower Yakima Irrigation Company will install pumping plants this year to water 10,000 acres above the canal at Richmond, where 14,000 acres are already under ditch.

The Board of County Commissioners has granted a franchise to the Kettle Falls Power and Irrigation Company, of Kettle Falls, to construct and operate telephone lines along the public highways.

The Secretary of the Interior has issued a public notice announcing that water will be furnished for the irrigation season of 1910 to about 1,626 acres of land in addition to the areas previously served under the Sunnyside irrigation project.

The first irrigation project in the Columbia River valley to receive water this year was the Burbank district, where water was turned in the main canal on April 8. The water was somewhat delayed by the concreting of a mile of the main canal.

The Upper Columbia River Irrigation Company has been organized to irrigate 300,000 acres of land between Bossburg and Northport. The capital stock is placed at \$1,000,000. Nearly \$300,000 has been expended on land, water-rights and a town site, the latter being twelve miles south of the international boundary.

Success of the Klickitat Irrigation and Power Company now seems assured, as the land owners of Horse Heaven have complied with the requirements of the promoters and capitalists, and the minimum of 250,000 acres has been reached. Owners of 260,000 acres have already signed applications for water-rights.

The Hanford Irrigation & Power Company of White Bluffs is installing a new irrigation system, to water the land around that city. This land was under a gas producer system for the past two years, but the system proved a failure and was discontinued. An underground wooden pipe system is now being installed.

Secretary of the Interior Ballinger has awarded the contract for construction of main laterals of the distribution system, under the Cowiche and Yakima branch of the Tieton irrigation project, to George Cooke & Sons of Spokane, Wash. This contract involves the construction of 36 miles of ditch near Naches and the excavation of about 385,000 cubic yards of material. The contract price is \$138,000.

An extension of sixty days has been granted to Mr. H. W. Hawley of Seattle, within which to complete his contract for the construction of the lower portion of Sulphur Creek Waste-way, Sunnyside irrigation project, Washington. The contractor was delayed in the execution of his work by the impossibility of securing transportation of materials owing to strikes on railroads and on account of floods and cold weather. The date of completion has been set forward to May 31, 1910.

The Secretary of the Interior has authorized the release, by notice to the Commissioner of Public Lands, of the flood waters flowing in Wenas Creek during the months of November to March, inclusive, each year. Such waters were set apart for the use of the government for the Yakima project in pursuance of the state law. In connection with the development of the Yakima irrigation project, Washington, there was a general adjustment of all water right claims during the irrigation season, extending from April 1 to November 1 of each year. It was therefore practicable to release the waters of this creek for storage during the period from November 1 to April 1 of each year, as the government could not readily arrange for the use thereof. The Yakima Highlands Irrigation and Land Company contemplates the storage of these waters in a reservoir sufficient in capacity to irrigate 5,000 acres, the water to be stored during the winter months when not needed by the government.

UTAH.

The Provo Reservoir Company's project was formally opened April 18. Water is diverted from Provo river and carried to the bench lands.

The survey for the Spanish Valley Land Company has

been made and work is to start within a few weeks. This company expects to irrigate 10,000 acres of land about six miles from Moab.

The Oasis Land and Irrigation Company's project, composed of 43,000 acres, has been approved by the state land board under the Carey Act. The contract has been ratified and the work of reclaiming will be made at once.

A franchise has been granted to the Sego Irrigation Company of Provo to construct a twenty-inch pipe line from the mouth of Provo Canyon along the country road to convey water to the new town of Ionia on Provo bench west of Olmstead.

Ephraim Dastrup of Sigurd has been experimenting with irrigation by pumping. During the past year he has sunk six wells, all of which are giving good flows. His neighbors are watching the experiment with interest and it is said that a number of wells will be sunk this year.

The case between the Moab Irrigation Company and the Wilson Mesa Irrigation Company, in which the water rights for approximately 20,000 acres are involved, has been continued until August. The defendants represent that they wish to secure expert agromists to test the Moab soil and testify as to the supply of water there.

Citizens of Moroni and Fountain Green are planning to bring under cultivation the large tract of land between the two towns. The proposition is to drill for water along the bench land above the tract, and if it is found, to install a system of pumps by which it can be raised to the surface. The power by which these pumps would be made to operate can be secured from the Big Springs Electric Company at Fountain Green.

The Provo Reservoir Company's irrigation system was opened April 18. Work on the diverting dam, or intake, was commenced in September, 1909. The intake is opposite Carter's station near the mouth of Provo canyon, where a cement dam is constructed across the river. The cost so far has been about \$75,000, and it is probable the system will cost \$500,000 when completed. Land embraced in this project is about 10,000 acres.

It is reported that one of the largest irrigation projects in the history of reclamation in Utah will soon be launched by capitalists. It is said to involve an ultimate expenditure of from \$5,000,000 to \$10,000,000, the land to be reclaimed being in Uintah county. William H. King of Salt Lake and John T. Pope of Oregon are reported to be interested in this project. It is predicted that within the next two years the project will be completed.

Articles of incorporation have recently been filed by the San Juan Land Company, with headquarters at Spokane, Wash. The capital stock is placed at \$100,000, fully paid. R. G. Belden, vice-president, states that four wells have already been drilled to supply water to 1,500 acres of the land located at Bluff. The company proposes to sink additional wells to irrigate about 8,000 acres near Monticello. Officers of the company are R. G. Belden, vice-president; A. E. Wayland, secretary, and B. D. Harshberger.

A stock company was organized at Moab recently to construct a reservoir on La Sal Creek at Rattlesnake Flat, about thirty miles above Moab, to store water during the winter months and irrigate 20,000 acres. W. E. Sheldon, chief engineer, has reported the project to be feasible. Among those interested are Engineers W. E. Sheldon and Harry H. Preston, J. M. Cunningham and T. B. Carpenter of La Sal, D. M. Cooper, V. P. Martin, Dr. J. W. Williams, G. P. Bryan, R. C. Clark and J. H. Clarke of Moab.

On May 25, 25,000 acres of inherited Indian lands on the Uinta reserve will be sold. Sixty-three separate allotments are advertised for sale, including tracts in nearly every part of the Uinta and Ouray agencies. All of the land has water rights and is covered by a complete irrigation system. Bidders must forward sealed bids to Acting Indian Agent C. G. Hall, at White Rocks, Utah, and must enclose a certified check to the amount of 25 per cent of the offer made. If the bid is accepted the balance must be paid within 60 days.

The Middle Canyon Irrigation Company and John Berclay of Clear Lake, Utah, have applied to the state engineer for permission to use certain waters in the state

for irrigation purposes. The first named company desires to use all the spring, snow waters and all other waters flowing through the canyon, for the irrigation of about 800 acres. The second application relates to the irrigation of 3,520 acres in Beaver and Millard counties, the water supply to be drawn from the Beaver River. It is estimated that 50 cubic feet per second will be required.

The Provo Reservoir Company has stated that it will be ready to deliver water to farmers on the highlands of Provo bench within the next few weeks. This project includes about 9,000 acres. Water is taken through Provo river from lakes at the head of Provo canyon and other sources. A number of contracts between the company and water users have been filed with the county clerk. The cost with water is \$75 per acre. Ten annual payments are provided for and at the end of twelve years the system will belong to the users. Jesse Knight, Joseph R. Murdock and Joseph B. Keeler are interested.

TEXAS.

Construction work has commenced on the canal and reservoir near Chopin. Water will be taken from the Rio Grande river above La Lomita.

Wm. Donnell and Messrs. Robertson and Dooley of Graham, Texas, will irrigate 700 acres of land on the Clear Fork river, in Young county. Several pumps have been installed.

The National Land & Sub-Irrigation Company of Independence, Kas., with a capital stock of \$3,000,000, has recently filed articles of incorporation and has established a southwestern office at San Antonio. Thos. Wagstaff is president of the new company, and Logan H. Bagby is vice-president.

NEW MEXICO.

E. M. Teel of Hope has filed an application for waters of the Penasco, which has been approved.

Mr. Burke Machey of Dayton has filed an application with Engineer Sullivan to pump waters from springs along the Penasco. This application has also been granted.

Irrigation by pumping is being carried on extensively around Deming. J. M. Williams has just installed a 25-horsepower vertical motor for use on his ranch near Deming.

Final surveys of the Urton Lake Irrigation project have been completed and it is likely that work on the ditch will be begun immediately. This survey includes about 100,000 acres of the best land in the territory. The channel of the main canal will be 100 feet wide. A dam will be built about 30 miles north of Albuquerque.

Territorial Engineer Sullivan has approved the application of the Cat Claw Canal Company for an additional 56 second feet out of the Pecos river for a new canal, to cost \$10,000. This will reclaim 5,600 acres. The application of Sammons & Pitrat of Farmington for 180 second feet out of the Las Animas river to generate 500-horsepower was also approved.

The Taos Valley Irrigation Orchards Company filed articles of incorporation with Territorial Secretary Nathan Jaffa. This company has a capital stock of \$500,000, divided into 5,000 shares. The headquarters of the company are at Taos, and Alexander Gusdorf is the territorial agent. The incorporators and directors are: Alexander Gusdorf, Bertha Gusdorf, Gerson Gusdorf, all of Taos; J. Ralph Young, Callidore D. Weiner, both of Colorado Springs. The company proposes to build four irrigation projects. Water will be taken from the Ranchos del Rio Grande, Canada de los Alamos, Miranda Arroyo and Rio Chequito.

Territorial Engineer Sullivan has approved the application of W. P. Turner, W. R. Kinney and W. R. Allison, of Roswell, for 100 second feet of water to produce 1,000-horsepower at a cost of \$25,000. He has also approved the application made by William Benson of Artesia, for 90 second feet of water to produce 10,980-horsepower at a cost of \$150,000. The last named project is to have five power stations. A hearing was given the Sandia Land and Improvement Company and D. R. Benston to conflicting applications for the waters of Tijeras canon. This hearing resulted in Mr. Benson withdrawing his application in favor of the land company. Territorial Engineer Sullivan has now approved the application of the land company whereby they may irrigate 640 acres of land from Tijeras canon, subject to prior rights.

After the testimony and the arguments in the condemnation proceedings instituted by the government of the United States against the Victorio Land and Cattle Company, involving the land to be covered by the Elephant Butte dam, the defendants have filed their final report. The government offered the Victorio Land and Cattle Company \$65,000 for the 30,000 acres of land which the waters of this dam will cover. The land was assessed at 30 cents an acre for taxes, but the company demanded \$600,000. After the condemnation proceedings were instituted the company demanded \$1,000,000 additional for a strip of land 1,200 by 100 feet in size, which would form the site of the dam. The appraisers assessed the value of the land at \$199,097.25, from which they deducted \$1,380 for the land in litigation, to be held in trust and paid to the rightful owner as the court should decide. The appraisers also awarded the company the right to water its cattle from the reservoir. It is now announced by the engineer in charge that work will be resumed and pushed to completion at an early date.

WYOMING.

The Secretary of the Interior has approved the award of the following contracts for excavation of portions of the lateral system under the North Platte Irrigation project, Nebraska-Wyoming: To Eddie E. Madson, of Minature, Neb., for the excavation of approximately 9,600 cubic yards of material, contract price \$1,104; N. A. Nelson, 7,900 cubic yards of excavation, contract price \$932; J. F. McAllister, 31,900 cubic yards of excavation, \$3,514.75; George W. Horn, 8,300 cubic yards of excavation, contract price \$993.

The North Platte Irrigation Company has let the contract for the installation of the initial units of a power plant which is to supply electricity to this district of the Wagner Electric Company of St. Louis. The power house will be located a mile below the North Platte Company's reservoir on the La Prele, and the fall from the reservoir will be used to generate electrical power. The plans for the completed system call for an expenditure of \$400,000. Electricity will be supplied to irrigators along the Routt river for use in pumping water from the river to their lands.

MONTANA.

At a recent meeting of the Tongue River Irrigation Ditch Company held at Miles City a committee was appointed to endeavor to secure the consent of the water users under the ditch, to a proposal to organize an irrigation district under the statutes governing such matters.

W. I. Moody, who has been connected for the past five years with the Bitter Root Irrigation Company, has announced his resignation, to take effect at once. It is announced that Frederick H. Nichols has also resigned as general sales manager of the company.

The Secretary of the Interior has awarded contract to the Atlantic Equipment Company of New York City for furnishing two 30-ton steam shovels for use in the work of the Reclamation Service on the Sun River and Flathead irrigation projects, Montana. The contract price is \$6,900 each.

The Secretary of the Interior has awarded contract to Mr. C. H. Hall, of Sears, Mont., for excavating and grading work necessary to raise dam and dike above the main canal of the Lower Yellowstone irrigation project at Burns Creek, Mont. The work involves about 7,000 cubic yards of excavation and the contract price is \$2,130.

The Red Rock Reservoir and Irrigation Company project has been approved by the Carey Land Act Board and filings have been made in the local land office. The company proposes to reclaim 12,000 acres of land in Madison county. A reservoir has been constructed and the land will be thrown open to settlement as soon as the Washington officers approve it.

A contract involving \$1,000,000, which will result in the complete irrigation of 130,000 acres of land on the Conrad-Valier project, was signed in Great Falls recently by the Conrad Land and Water Company and Kennefick & Russell of Kansas City. The contract calls for the completion of certain work by the first of July and the entire project to be finished during the present season. Work will be started immediately. The Arnold Company have charge of the engineering of the project, and the general management and colonization end of it will be taken care of by Clinton, Hurtt & Co., of Boise and Chicago.

IDAHO.

A contract to construct nine miles of the Portneuf March Valley Irrigation Company's canal near Downey has been let to E. W. Gayman of Ogden. The work will begin at once.

The American Falls Canal and Power Company is seeking to induce the settlers on the tract to operate the canal system here. It is stated that it will require \$12,000 to operate the system this year.

The Secretary of the Interior has awarded contract to the General Electric Company of Los Angeles, Cal., for furnishing electrical equipment for substations under the Minidoka irrigation project, Idaho. The contract price is \$9,684.

The Secretary of the Interior has issued a public notice announcing that the charge for operation and maintenance of the Minidoka irrigation project, for the season of 1910 and annually thereafter until further notice, shall be 75 cents per acre of irrigable land.

The Secretary of the Interior has awarded contract to the Standard Underground Cable Company of Pittsburgh, Pa., for furnishing copper wire to be used in extending the electric transmission line to the towns of Rupert, Heyburn and Burley, on the Minidoka irrigation project. The contract price is \$3,263.37.

Land owners in the vicinity of Emmett held a meeting recently for the purpose of sending a petition to the government to restore the north side unit of the Payette-Boise reclamation project to the public domain. A petition was also signed to the county commissioners to form an organization known as the Black Canyon irrigation project. About 110,000 acres of land is embraced in this project.

E. F. Eagleson, L. L. Folsom and associates have filed an application for the segregation under the provisions of the Carey Act for 300,000 acres. The cost of this project is \$20,000,000. A dam 250 feet in height will be constructed on the Boise river about twenty-five miles above the city. The approximate cost of the dam is \$3,000,000. The water right price is \$100 per acre. The Kuhn-Buhl interests are backing the deal financially.

Engineers are at work making the final survey for the great dam which is to be erected at American Falls for the purpose of storing waters to irrigate the Bruneau tract of 600,000 acres. The project known as the Twin Falls-Bruneau project will cost \$500,000. The project includes a system of reservoirs extending from the headwaters of the Snake river to the point above the Milner dam which is to be reinforced and utilized for the diversion of water for the new project. The high line canals will be enlarged and extended to Salmon river, over which the flow of water will be conducted by means of inverted siphons.

COLORADO.

An irrigation district in the neighborhood of Lay and Maybelle is in process of formation. Water will be secured from the Elk river.

A petition was also filed with the county commissioners by the Elk river irrigation district, which intends to irrigate lands on the mesas north of Hayden.

A petition was presented to the county commissioners at a recent meeting by the Routt County irrigation district providing for irrigating lands on the south side of Hayden valley.

An irrigation project embracing 150,000 acres has been started by J. Albert Wright of Denver. A ditch 105 miles in length will be constructed at an estimated cost of \$3,000,000. The ditch will start northwest of Delta and end near Grand Junction.

Water has been taken from the South Platte river to irrigate 62,500 acres of land northeast of Denver. This system is known as the Barr lake reservoir system. The Barr lake reservoir will supply the Denver-Greeley Valley municipal irrigation district, known as the Hudson district.

It is reported that the Northwestern Irrigation Company, near Steamboat Springs, is asking for bids to construct a tunnel 4,000 feet long under Yellow Jacket Pass. Water will be taken from the north fork of White river in Rio Blanca county to irrigate lands in the southwest part of Routt county.

All reservoirs in the Denver-Greeley valley irrigation district are completed with the exception of Milton reservoir, which will be finished by June 1. Over 60,000 acres of land are embraced in this project.

Suit has been filed in the district court by R. W. Sawyer against the Riverside Irrigation Company. Mr. Sawyer alleges "misrepresentation, fraud and deceit," and demands payment of \$1,543 commission and moneys which he claims he advanced as a result of what he avers to be false statements on the part of the officers of the board.

The Boyd Lake Reservoir and Irrigation Company has purchased Boyd lake from B. D. Sanborn of Greeley. This is said to be the largest body of water in northern Colorado. Articles of incorporation have been filed by the Boyd Lake Reservoir and Irrigation Company, with a capital stock of \$400,000. Incorporators are B. D. San-



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The small irrigated farm or orchard means greater production with less labor. It takes away the element of chance and makes a good crop

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a reasonable certainty. The land in the Northwest such as is being irrigated by government and private projects in Montana, Idaho, Washington and Oregon, on or reached by the Northern Pacific Railway, is exceedingly rich and requires only moisture to yield bountifully. This moisture is provided by irrigation, which makes irrigated farming, fruit and vegetable raising a scientific profession, not a drudgery. The ideal climate is a strong argument in favor of the Northwest.

If you want to know more about the possibilities of making your efforts bring you greater returns, write for information about these irrigated lands. Maybe the "dry-farming" territory will interest you. Write tonight and state what section you are most interested in. Don't delay. The information will cost you nothing and will pay you well.

The Scenic Highway Through the Land of Fortune

Northern Pacific Railway

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born, Halstead L. Ritter and Joseph C. Helm. D. A. Canfield is also interested in the company. The lake covers 2,022 acres.

A ditch plat was filed with the county clerk recently by J. Albert Wright of Denver, the president of a new irrigation company. It is proposed to spend \$3,500,000 in the construction of a ditch 105 miles long, to irrigate 150,000 acres, and with a capacity of 2,350 cubic feet per second. It is 69 feet across, top measure; 45 feet, bottom measure, and 12 feet deep. It is to be called the Excelsior High Line Ditch. The land to be irrigated lies north of the Gunnison river. The water will be taken from eighteen creeks.

Water has been turned into Standley lake, an immense reservoir to irrigate 100,000 acres of land north-west of Denver. Water for this system is taken from Clear creek and South Boulder creek. A tunnel has been built through the mountains and water diverted through it from the western slope to add to the supply. Joseph Standley, president of the Denver National Company, is at the head of the enterprise. Denver and Chicago capitalists are interested. The enterprise is known as the Denver Reservoir Irrigation Company.

Residents of the Golden-Littleton irrigation district, embracing about 15,000 acres of land near Denver, have refused to approve the contract entered into with the directors of the Camfield Development Company whereby the latter company was to furnish water to the district from Williams fork of the Grand river by tunneling through the divide at Jones' pass. The reason advanced by the residents of this district for opposing the contract is that the government figures regarding the supply of water to be taken from Williams fork did not agree with those of the construction company's engineers.

The Riverside Land and Irrigation Company, whose announced purpose is the reclaiming of immense tracts of desert fruit land between Delta and Palisade, is being investigated by agents of the federal government. It is not, its officers say, being investigated against its will. The officers and directors of the company yesterday issued a public statement outlining the purposes of the company and declaring that the most rigid investigation is invited. J. A. Wright, president of the company, repeats an offer made before to place all the facts before a committee named by the chamber of commerce of Grand Junction for complete investigation.

Active work has begun on the De Weese irrigation project, near Canon City. The first dam and reservoir will be constructed about four miles from Salida on the Arkansas river and will have a capacity of 100,000 acre feet. From this reservoir the water will be conveyed down the channel of the Arkansas to a point near Texas creek, where a diversion dam will be built in the river. From this point a canal twelve miles in length will carry water through the canon of the Arkansas, leaving the river bank near Barkdale, hence diverging across Webster park for a distance of six miles to Grape creek. Here the main canal is joined by the waters conveyed down the Grape creek channel from the reservoir on upper Grape creek in the Wet Mountain valley. The second reservoir is situated near Westcliffe, in Custer County, and has a capacity of 125,000 acre feet. The dam retaining this reservoir will be 187 feet high. A 1,600-foot tunnel will be bored through a mountain ridge. Contracts have all been let.

MISCELLANEOUS.

Work on the Casa Grande Valley Canal Company's project is rapidly progressing and the main canal will be completed within eight months.

A temporary irrigation plant has been installed on the farm of John Uglow, two miles north of Starke, Fla. The plant is being installed by Livingston & Co.

Alex Mead of Greeley, Colo., A. A. Edwards of Fort Collins, and D. A. Canfield of Denver, together with ten other irrigationists, will promote a big irrigation enterprise near Yuma, Arizona.

Farmers in the vicinity of Florence are experimenting with pump irrigation. Charles Stewart of that city has installed a ten-inch centrifugal pump and forty-horsepower gasoline engine, with which he will be able to irrigate his eight hundred acres of land.

(Continued on page 331.)

GET A GOVERNMENT FARM

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You get from Uncle Sam either a 320-acre farm, FREE, or an irrigated farm for the mere per capita cost of the irrigation system

320-acre Farms Free

The U. S. Government is now offering over three million acres of homestead lands in eastern Wyoming, along the Burlington Route, under the new Mondell homestead law permitting settlers to take 320 acres instead of the usual 160-acre homestead. These lands are ideal for dry farming and hundreds of farmers have made a success of this method of farming in the locality where these lands are located.

Irrigated Government Lands in The Big Horn Basin and Yellow- stone Valley

where rich productive lands with perpetual water right may be purchased for about one-half the cost of land in the central states and where the water can be turned on and off the land to suit the convenience of the farmer, and where you are not bothered with rain during harvest; where a single crop can be made to pay for the land; where 50 bushels of wheat and 75 bushels of oats commonly grow to the acre.

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These lands are being rapidly taken up and ere long all of the Government lands will be gone. Thereafter land will be possible of acquirement only at prices phenomenally high compared to those of to-day.

OUR PERSONALLY CONDUCTED EXCURSIONS on the first and third Tuesday of each month and cheap homeseekers' tickets on those dates, allowing stop-overs in both directions, will give you an opportunity to examine the irrigated lands and the Mondell lands on one trip.

OUR NEW FOLDERS WITH MAPS, showing the location of all of the above-mentioned lands and explaining in detail the crops raised, the natural resources of each locality, and the method of procedure to acquire title, will be sent to you, free for the asking. Write for them to-day. Free for the asking.

D. CLEM DEEVER, General Agent,
Burlington Route Landseekers' Information Bureau
137 Q. Building, OMAHA, NEB.

N. B. The winter weather in the Big Horn Basin Country is fine and lands can usually be seen to advantage all Winter.

(Continued from page 319.)

A single spraying is better than none and will usually be profitable, but more are better. Spraying may prove

Waterpower and irrigation properties in Texas for sale.

\$7,000 to \$30,000

Real worth \$25,000 to \$100,000

WADE B. LEONARD,
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to be highly profitable, even though the blight is only partially prevented. It is unsafe to postpone spraying until the blight appears. Except perhaps on small areas, it does not pay to apply poison alone for bugs. When it is necessary to fight insects, use Bordeaux mixture and poison together.

With these instructions, if carefully followed out, it should not be a difficult matter for the grower to secure a crop that will warrant all expenditures made for its improvement and leave a very nice profit besides. A barrel sprayer placed on a wagon with a four-row attachment connected to the barrel pump by means of a hose, makes an inexpensive and yet a very effective outfit for this work.

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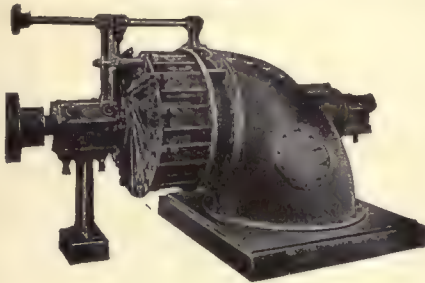
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2¢ a Rod

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It isn't likely.

Suppose you could. Your apparatus wouldn't perform a half-dozen more dirt-moving tricks.



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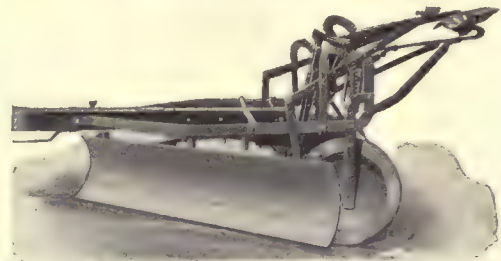
is the one great, useful money-saver and time-maker for the irrigator.

You must have seen or heard about the 20th Century. It's surprising how rapidly it is selling—independent buyers, agents, distributing centers springing up like jack rabbits in all sorts of places.

The reason? It's light, easy to handle, quickly understood, requires but one man—never more than four horses. Write for our catalog that shows how to grub brush \$1.50 per acre, 4 acres a day; how to build a mile of dirt road for \$5 to \$8 a day.

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THE ALBANY HOTEL

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Denver

Rates \$1.00 per day and upward

(Continued from page 319.)

After the amended plats have been filed, the entrymen affected will be allowed to amend their applications to conform to the irrigable areas shown on the plats, and all payments made will be credited to the gravity areas.

Payment of the charges for the high-land areas shall not begin until means shall have been provided for the reclamation thereof, whereupon public notice will be given announcing the charges, number of installments, and the time when payments shall commence. The charges to be announced for such lands shall include an equitable apportionment of the costs on account of the construction, maintenance and operation of any pumping system or other expenditures incurred by the United States for the reclamation of such high lands.

On February 15 the resignation of Mr. A. E. Chandler as engineer in the Reclamation Service took effect, and he thus severed his connection with the work upon which he has been engaged for seven years. In this time Mr. Chandler has performed valuable services and has contributed a great deal to the formation of the legal policy of the operations of the Service. His valuable co-operation will be greatly missed in the future.

Mr. Chandler has accepted a position as instructor on the subject of irrigation institutions in the University of California.

The Engineering News in a recent issue reprinted an article on "Depreciation," published in the "Reclamation Record" for May, 1909, together with comments on accounting methods in use by various branches of the government service in the matter of depreciation. The statement is made by the News that: "The Reclamation Service has elaborated a system of cost-keeping rarely, if ever, equalled on public works, and as a part of that system careful account of depreciation is being taken."

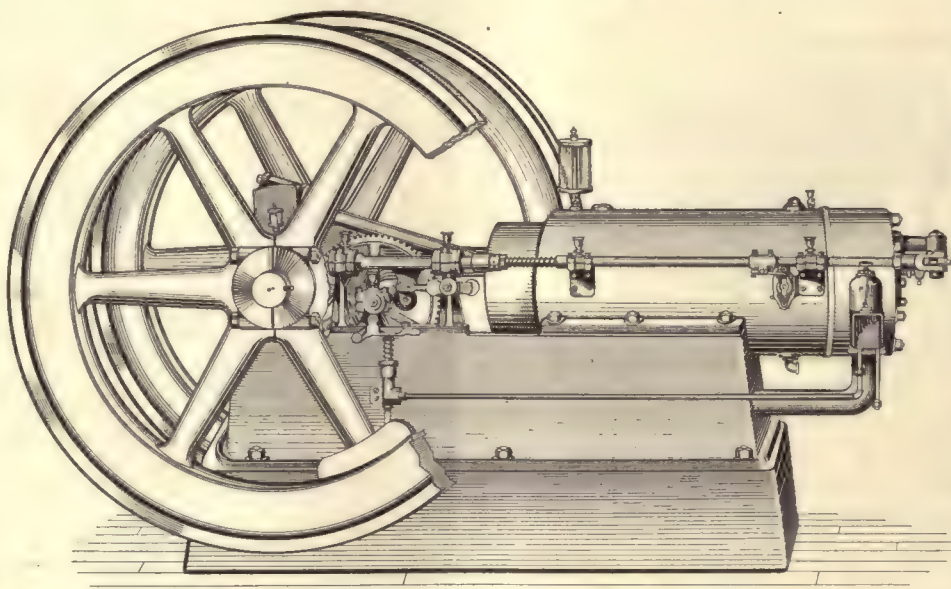
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BRANCH HOUSES
OMAHA
KANSAS CITY
SIOUX FALLS

(Continued from page 328.)

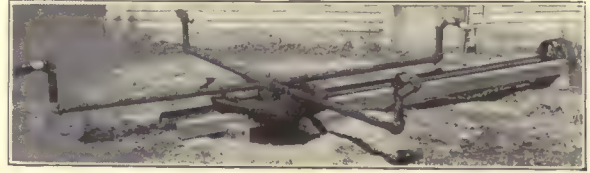
The irrigation project known as the Schell project in St. Landry Parish, Louisiana, which has been in course of construction for some time, is nearing completion. Five thousand acres of land will be irrigated this season. The main canal to the project is 350 feet wide and 30 miles long. The water is taken from the Bayou Courtblau, an arm of the Mississippi.

Milo B. Williams, an expert irrigation engineer has investigated the lands along the Congaree river in the lower section of Richland county, South Carolina, to determine whether or not it would be feasible to try the experiment of irrigation in this county. If it is successful, it is probable that the plan will be tried in several other sections of the state.

An irrigation project comprising 50,000 acres of valley land has been started in Mexico. It is the intention of the present owner, L. Villareal Madero, to cut up the land into small ranches to be used by truck farmers. The Mexican government has taken a great interest in irrigation of its land and will help finance the project. It will take five years to complete the work.

The interior department has refused to extend the government Okahogan irrigation project into the Colville reservation. The plan has been to get Indians holding allotments on the river lands within the reservation to give up their allotment and take seventy acres of the hill lands in exchange. The Indians sent a strong protest to the office of Indian Affairs in Washington, with the result that the Interior Department acted as above stated.

The State Charter Board of Kansas has granted a charter to a new irrigation company to be known as the Irrigation & Land Improvement Company of Dodge City, Kas. It is capitalized at \$50,000 and the purpose of this company is to irrigate a section of the Arkansas valley in the vicinity of Dodge City. It is authorized to construct dams, canals and dig ditches. The incorporators of the company are A. B. Reeves, P. I. Tribelock, H. O. McCarter, E. T. Dancy and John Madden, all of Dodge City.



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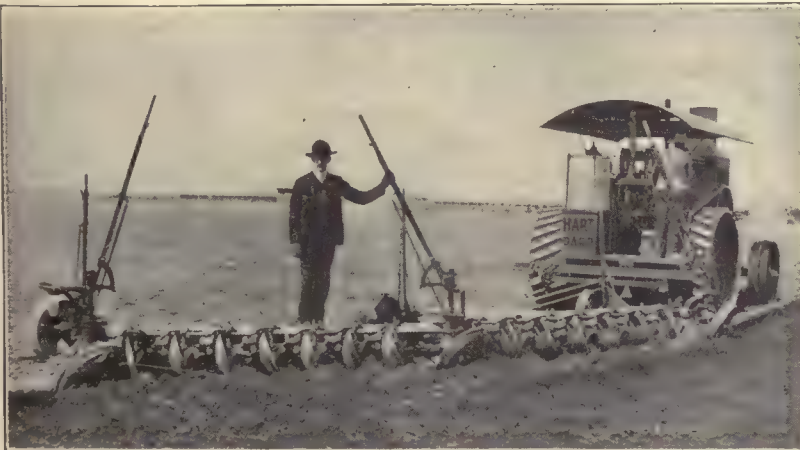
THE TRUMP MFG. CO.
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Built in sizes of 30, 45 and 80 H. P.

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FROST PROOF
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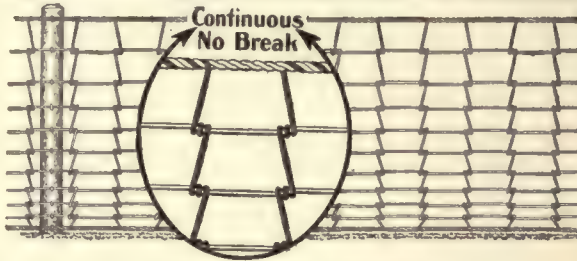
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What the farmer puts money and protection into, he's going to get money and protection out of.

Advance Woven-Wire Fence is the best looking, strongest constructed, longest lasting fence on the market. To prove it, we make our great offer. If the fence isn't O. K. to you, and more, send it back at our expense.

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(Continued from page 310.)

of French, at present an important station on the main line of the Atchison, Topeka & Santa Fe Railway and the El Paso & Southwestern branch of the Rock Island system. This land is also traversed on the west by the St. Louis, Rocky Mountain & Pacific Railway, which connects at Des Moines, New Mexico, with the Colorado & Southern Railway, extending from Denver to Galveston, Texas. These three lines of railway, with their connections, give access to all the principal points and the best markets in the United States.

A particularly attractive feature about these lands is that the high mountain ranges effectively protect the valley from severe winter storms, such as are encountered in other sections. The average altitude is about 5,500 feet, which insures a delightful summer climate with a winter climate similar to that of Denver, with which we are all no doubt familiar.

We are showing, in this connection, an illustration of equipment used in preparing this land for irrigation. It is said by the members of this company that it is not necessary to level this land, as is done in other districts. They do, however, go over it with home-made equipment, such as is shown in the illustration, to bring it to the proper condition for putting in crops.

The soil is a dark chocolate color, and varies in depth from three to ten feet. The subsoil is a clay loam, which is very valuable, as it gives the soil a good capacity for storing moisture. The fertility of this soil has been demonstrated by the older ranchers in the Antelope Valley, and by the farmers on the French tract, and is no longer an experiment.

The editor of this journal paid a hurried visit to the French Land & Irrigation Company's project not long since, and it is his intention to go over the tract thoroughly some time within the next sixty days, and secure data and photographs to enable him to clearly illustrate and describe the great possibilities for home building and money making in this vicinity.

Additional information concerning this project, with illustrated literature, may be secured by addressing the French Land & Irrigation Company, 604 Atwood Building,

THE GOULD COMPANY

Ohio and Franklin Sts., Chicago, Ill.

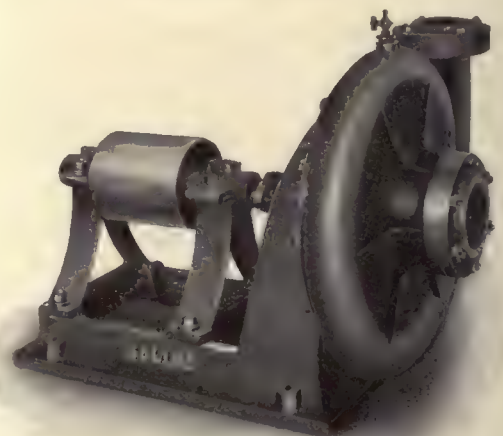
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Used for Irrigation, Circulation, Sewerage, Etc.

Chicago, Phone Main 5348, or by addressing the company at its headquarters, at the town of French, New Mexico.

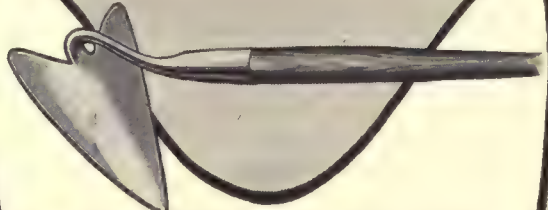
As above stated, we intend to publish additional articles concerning this tract, giving more definite data. Those of our readers who are desirous of securing special information are requested to address the company, as above.

(Continued from page 301.)

early in the spring, and it leaves the soil in the best condition for his seed bed. Small seeds as alfalfa and grains do much better if they are planted on plowed ground that has become fairly compact. Plowing for potatoes or root crops where the soil is compact should be done immediately before the time of planting. Plowing for fall-sown grains, under the two-year fallow system, is better in fall if possible or it may be done in spring or early summer.

The moldboard plow will do better work than the disc. On this account we strongly recommend the use of moldboard plows for first breaking the sod. Disc plows have come to stay, and while they do not do good enough work on sod, they give excellent results for stubble or other old ground, and the draft is easier than with the moldboard plow. The disc is also important to the dry farmer because with it he may plow soils so dry that the old form of plows could not be made to stay in the ground. The main difficulty with the disc plow is not so much in its use as in its misuse. Nearly every one tries to cut too wide a furrow with their discs, which results in a sort of cut and cover plowing which will not give the best crops.

No one form of moldboard plow can be recommended for all soils. Where the soil contains much clay or gypsum and lime, we have found the steel moldboard will scour better than a chilled plow. We believe in using a plow with a steel moldboard and with interchangeable lays. The use of cast shares have some advantages. On hard soils they are cheaper. The old share when worn out is thrown away and



THE IDEAL HOE FOR IRRIGATED LANDS

When you draw furrows for irrigation, use the hoe that leaves both ridges the same height, preventing overflow.

The Warren Hoe

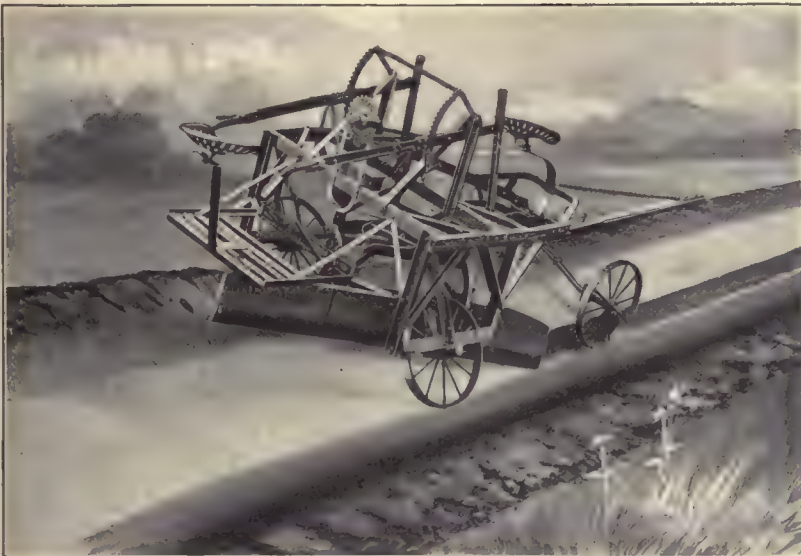
not only does this, but is valuable for drilling, covering seed, hilling and cultivating. It's a True Temper tool with the trademark of the manufacturer.

Sold by dealers everywhere.
Write for our free booklet "Tools and Their Uses."

American Fork & Hoe Company
Dept. A Cleveland, O.



The Little Roadster Grader and Ditcher



THE LITTLE ROADSTER

A New, Light Ditch Plowing Machine, Especially Designed for Cutting Small Laterals on Irrigated Farms, and Ditching and Grading Roads.

This type of machine cuts ditches for less money than any other tool or machinery, because it plows the dirt out of the ditch with one continuous motion, whereas all other ditching machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling landsides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

EVERY IRRIGATED RANCH OR FARM NEEDS ONE OR MORE OF THESE MACHINES. IT WILL QUICKLY PAY FOR ITSELF. SEND FOR DESCRIPTIVE FOLDER AND LET US TELL YOU MORE ABOUT IT

J. D. ADAMS & COMPANY, INDIANAPOLIS, INDIANA

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IRRIGATION MADE EASY

with the **BROTHEN AUTOMATIC LEVEL**

Gives automatically the level or any grade desired, and will verify the correctness of its own work from where it is operated.

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BROTHEN AUTOMATIC LEVEL COMPANY
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JUST RIGHT

That is what
purchasers of
the

**SHUART
GRADER**

say about it.

A card from you will bring all the information you want
about Irrigation Graders or Ditchers

The Ohio Road Machinery Co. Box F Oberlin, O.

the new one put on always leaves the plow full width. Every time a steel lay is sharpened it gets smaller, so a fourteen-inch plow does not remain fourteen inches. The steel lays are useful, however, in many soils, and if a farmer has a soil upon which he can use both kinds he can take advantage of all these conditions. A modification of the old sidehill plow is the new two-way plow with which the field may be turned from one side and avoid extra tramping as well as dead furrows and back furrows.

Where fields are large enough and long lands can be laid out, plowing by steam or gasoline is being adopted in many parts of the West. On our dry prairies at considerable distances from water and coal supply, steam plowing proves expensive. There are new gasoline or kerosene power engines which are coming into favor for both plowing and other forms of power needed on the farm. A steam engine requires for its running an extra man and team with water tank, and where distances from water and coal are great, this item of expense is a large one. The main difficulty with any kind of power plowing seems to be lack of knowledge and skill on the part of operators. This kind of work has been eminently successful where men who understand their business can be obtained to do the work.

(Continued from page 306.)

and the class of big-brained, big-hearted, strong-muscled people there brought together.

I think it is quite safe to predict that Southern Idaho will always be in the forefront of all the irrigated sections of the West, and I expect to see the land sell within a short time for \$200 per acre. I heartily congratulate you and your associates for having achieved a notable thing in the way of a great world movement.

Yours sincerely, **JOSEPH E. WING.**

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.



Why OTTO Products are Cheapest

Second Reason



READ THIS LETTER.

A. Nacke & Son
Manufacturers of Special
Machinery and Metal Novel-
ties, Philadelphia, Pa.

The Otto Gas Engine Works,
Philadelphia, Pa.

Gentlemen:—After using electric power for over eight years, it is with pleasure we can state your salesman eventually induced us to invest in a gas engine.

Your engine has been running daily in our shop for the past year, and in comparing the cost of power of former years with this year we find there is a saving of over 50%, or in other words the engine has paid for itself the first year.

Yours very truly,
A. Nacke & Son.

IF MOST GAS ENGINES WERE GIVEN TO YOU FREE THEY WOULD STILL PROVE MORE EXPENSIVE THAN THE OTTO IN THE LONG RUN!

This is one of the reasons why
These photographs show you how the Otto is cast in four distinct parts, viz.,—the frame, cylinder, water jacket and cylinder head.

But the economy is obvious—
This costs a little more than casting several parts in a unit as is usually practiced.

Suppose you damage one of these parts by accident; for instance your water jacket should get broken.

With the Otto all you have to do is remove the damaged jacket alone and it can be replaced or repaired immediately.

But suppose your engine isn't an Otto; then your water jacket, cylinder and frame are probably all cast together.

You would have to either ship the entire business off for repairs or replace practically a whole new engine.

Then where would your small saving of first cost be?

See the logic of it?

Besides, all cylinders need re-boring sooner or later. With the Otto instead of shipping a whole engine to us or

we shipping a whole re-boring plant to you, all you have to do is to remove and send us the cylinder itself.

And this construction is only one of the details which make the Otto cheapest.

We want to give you more evidence if you will drop us a line. There's an Otto user in your neighborhood. Let us tell you who he is. Let us help you out of any special difficulty you are up against. Fill in the coupon—now.

OTTO GAS ENGINE WORKS, 3231 Walnut St., Philadelphia, Pa.

Branches: Chicago, Boston, New York, Pittsburgh, Omaha, Kansas City, Minneapolis, San Francisco.

COUPON

Gentlemen:—

Send me catalogs, etc., together with approximate estimate of installation of an "Otto" Engine of . . . H.P.

Name

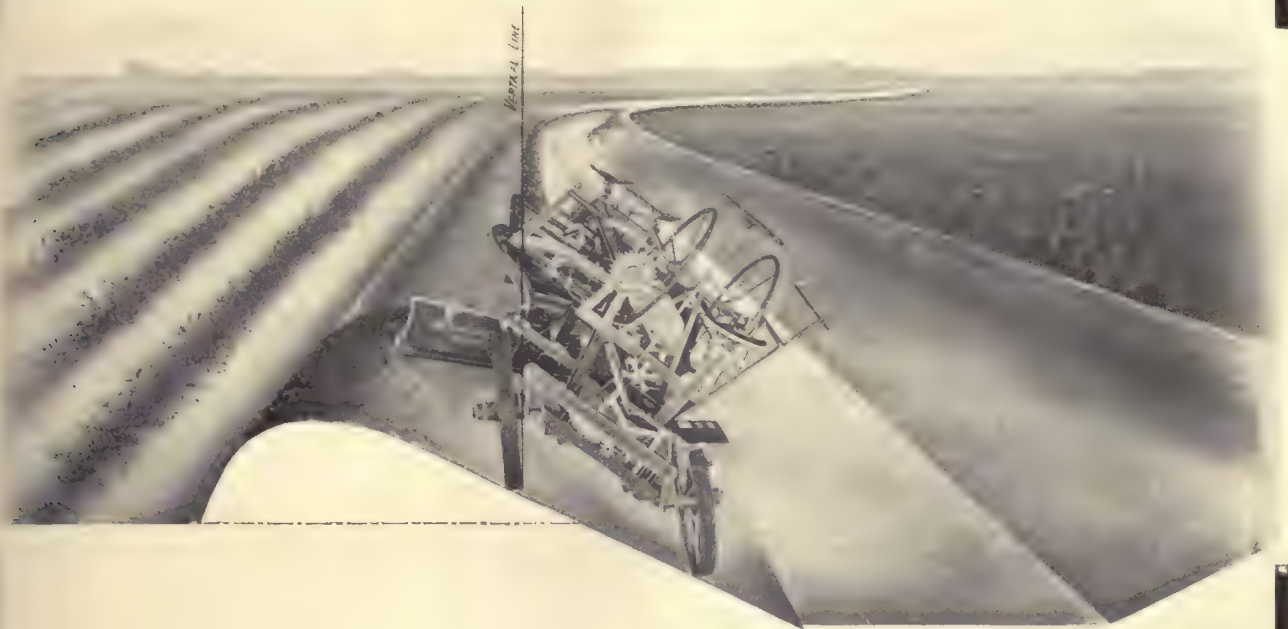
Address

Firm name

Capacity of plant

THE RECLAMATION DITCHER

For Cutting Irrigation and Drainage
Ditches at the Least Cost



U. S. RECLAMATION DITCHER

This type of machine is different from all other ditching machinery, in that it plows the dirt out of the ditch with a continuous sweeping motion, whereas all other machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The cost therefore, per cubic yard, of excavating with the U. S. Reclamation Ditcher is necessarily much less than with any other tools or appliances.

The Reclamation Ditcher is adapted to cutting ditches as deep as three feet below the original surface and as wide as ten feet at the bottom and with sides sloped as steep as 2 to 1.

It has adjustable oblique wheels which perform the same function as the oblique wheels of a sulky plow. They are simply rolling landsides which counteract the side pressure of the earth on the mold and also make it possible for the machine to be operated on the sloping side of the ditch as shown in the cut.

It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

The difference in cost of cutting ditches with the Reclamation Ditcher and any other form of machinery is sufficient to pay for the machine very quickly. We absolutely guarantee this and will prove it to you by a demonstration of the machine on your own work before you accept it.

Write for descriptive folder which gives diagrams of ditches and cost estimates.

J. D. ADAMS & CO., Indianapolis, Indiana

VALUE OF THE MUSKRAT.

On account of the increasing scarcity of fur-bearing animals considerable interest is being manifested in the muskrat. Both the fur and the meat are staple articles in some of the markets of the east and middle west during the winter months. The furs are used largely by fur dressers and

dyers and are made to closely imitate the more costly furs, thus creating a continuous demand for the pelts.

Owners of marsh lands have already made the trapping of muskrats profitable, converting otherwise useless lands into income producing investments. Many lease the trapping privilege to those who make a business of trapping.

BRISBANE ON MISSOURI'S AGRICULTURAL COLLEGE.

"A magnificent American institution is the State Agricultural College of Missouri in the town of Columbia."

That is the first sentence of an editorial recently written by Arthur Brisbane, the highest salaried newspaper man in the world. The Editorial filled a page in each of the Hearst newspapers, published in New York, Chicago, Boston, Los Angeles and San Francisco, having an aggregate circulation of about 2,000,000 daily. That means, at a conservative estimate that it was seen by 6,000,000 persons. The editorial was written by Mr. Brisbane in New York from personal observation of the work of the College of Agriculture, made during his visit to the University of Missouri this year.

Here are some of the striking things said by the \$70,000-a-year editor about the college:

"It would be well if every farmer, every farmer's boy, every intelligent citizen in the United States, could visit that splendid practical laboratory, study it and understand it.

"Some of the country's big men are telling us that we shall soon exhaust our resources; that if the land isn't better developed, and the earth made more fruitful, the human race will starve.

"There at Columbia they are not talking, but they are solving the very problem of the so-called big men.

"It is well worth traveling half way across the continent to see that Agricultural College of Missouri, to learn what splendid work is done there, to study the orchard with a hundred different kinds of apples in one, the fine horticultural department, the earnest professors and students working at the great modern problem, increase of the food supply.

"That college is doing another work of the greatest value to the race; it is doing the work that will put men back on the land, where they belong. The student there is filled with enthusiasm. He looks upon farming not as drudgery, but a scientific problem, a work of benefit to all humanity.

"There are many thousands of men with a little money saved up that would instantly become farmers if they could take the course at such a college and learn what it means.

"Fortunately, similar colleges are to be found all over the United States, some perhaps as good, none better than the one mentioned."



DOUBLE POWER

\$1,000 Reward

for its equal. Wind power doubled. Two 14 ft. wheels work on same pinion; second wheel gives more power than first.

A Governor That Governs

In all winds. Develops 10 full h. p. in 20 mile wind. All power needed for farm, shop, irrigating, etc. Ask about our self-oiling, self-governed, single wheel pump—also Armsaver Husker. Ask for book 80

DOUBLE POWER MILL CO.

Appleton, Wis., U. S. A.

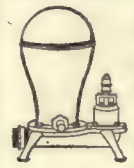
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For Irrigation, Mining, Manufacturing or any Business.

Procured in Leading Charter States. Agencies Maintained. Bluebook FREE.

NATIONAL INCORPORATING CO.

PIERRE, S. DAK.



A SATISFACTORY WATER SUPPLY ALWAYS PAYS DIVIDENDS

A Humphryes' Hydraulic Ram will furnish you, when installed, with a permanent and automatic water supply. Why spend money on costly pumping plants and time, strength and expense in operating same, when a Hydraulic Ram will lift your water and deliver it with absolutely no expense. The Humphryes' Pneumatic System will supply your residence with water under pressure for all domestic purposes and give service heretofore obtainable only with an elevated tank or direct connection with municipal water works. Our New Catalog "Domestic Water Supplies" tells you all about the HYDRAULIC RAM and PNEUMATIC SYSTEM and will be mailed you upon request.

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For Irrigation Systems and Water Works

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Write for Our New Catalog containing over 1500 beautiful photographic illustrations of Diamonds, Watches and Artistic Jewelry. Select any article you would like to own or present as a gift to a loved one; it will be sent on approval to your home, place of business, or express office, without any obligation whatever on your part. If it is satisfactory in every way, pay one-fifth down and keep it, balance in eight equal monthly amounts. If not entirely satisfactory, return it. We pay all charges and take all risks. We have absolute faith in our goods because we know they are the very best quality and the highest grade of workmanship. Our prices are lowest; our terms are easiest. It is a confidential matter. Our customers use their charge accounts with us year after year, finding them a great convenience at such times as Easter, anniversaries, weddings, etc. Any honest person may open a confidential charge account with us. Diamonds as an investment are better than a savings bank because they pay four times the rate of interest. They are increasing in value 15% to 20% each year. Write to us today.

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THE OLD RELIABLE ORIGINAL DIAMOND AND WATCH CREDIT HOUSE

SPECIAL BARGAINS
Ladies' and Gentlemen's Solitaire Diamond Rings
Terms: \$3.75 per month

\$37.50 No. 43

ON PRUNING SHRUBBERY.

Sometimes the most simple matters urge one into unnecessary work. Pruning shrubbery is one of these. This last winter was unusually severe, and half-hardy plants like the pivot and weigela were killed back or killed to the ground, the roots remaining alive. The only thing to do is to cut back each branch to live wood, leaving no dead wood at all. The new growth will come out in surprising fashion this summer.

The vital part of the plant is the

When writing to advertisers please mention The Irrigation Age.

root rather than the stems, and if the root is sound, the stem may go. A large, ungainly shrub may often be made handsome by cutting it to the ground and allowing it to grow up again.

Most shrubs not planted in hedge form are better in appearance if not pruned at all. With ordinary shrubs pruning should be the exception rather than the rule. If in planting, there has been a loss of roots, the top should be cut back enough to balance them, but usually shrubs are hardly enough so that they are as well let alone. At other times, there must be very good excuse for pruning. Cutting back spiraeas or lilacs in winter or spring is only cutting off their flowers, without helping the plants much. Most of all, no shrub other than a hedge plant should be sheared round or flat. Nothing can equal in beauty the natural form.

FEEDING WORK HORSES.

The Iowa Experiment Station has been conducting a series of experiments in feeding work horses. It has been found that oats are too expensive to feed in large quantities, and that the ration may be greatly cheapened by substituting oil meal, cotton seed meal, or gluten feed. The health, spirit, and endurance of the horses was the same when fed corn in combination with one of these feeds as when oats were fed. These experiments show that oil meal may be worth as much as \$60 a ton for horse feeding, and cottonseed meal a little more. The horses did a hard summer's work on these feeds without any considerable loss in flesh. These experiments are of great value to farmers everywhere, as the question of feeding the work horses cheaply, and at the same time in such a way as to keep them in good flesh, is an important one.

P & O
CAMPBELL SUB-SURFACE PACKERS

We are the sole manufacturers of this famous Sub-Surface Packer, the only one made.

This is the one that you have heard everyone talking about.

P & O CAMPBELL SUB-SURFACE PACKER.

Send for our Special Pamphlet on Sub-Surface Packing, the best known system for "dry farming," a method of absolutely insuring bumper crops with a minimum rainfall—the salvation of semi-arid regions.

Made in Three Sizes, with 10, 16 and 24 wheels, is heavy and strong, and the frame is made to carry all the extra weight required. Write for Catalog No. V 151

Parlin & Orendorff Co.,
CANTON, ILL.

(Continued from page 321.)

LIST OF STATION PUBLICATIONS RECEIVED BY THE OFFICE OF EXPERIMENT STATIONS DURING JANUARY, 1910. Pp. 5. (Document 1,251, Office of Experiment Stations.)

THE UTILIZATION OF PEA-CANNERY REFUSE FOR FORAGE. By M. A. Crosby, Assistant Agriculturist, Office of Farm Management. Pp. 12. (Circular 45, Bureau of Plant Industry.)

PUBLICATIONS OF THE BUREAU OF PLANT INDUSTRY. Pp. 12. (Document 548, Bureau of Plant Industry.)

COYOTE-PROOF PASTURE EXPERIMENT. Circular 160. Forest Service.

PRACTICAL ASSISTANCE TO OWNERS OF FOREST LAND AND TREE PLANTERS. Circular 165, Forest Service.

COMMERCIAL FERTILIZERS—THEIR USES AND VALUE. Document 441, Bureau of Plant Industry.

WHEAT, FLOUR AND BREAD. Separate 324, Yearbook, 1903.

OPPORTUNITIES IN AGRICULTURE. Separate 340, Yearbook, 1904.

SPRAYING FOR ORCHARD PESTS—INFORMATION ABOUT. Separate 480, Yearbook, 1908.

POTATOES PAY

Make them pay by using the machines that really do the work—

CUT, PLANT, SPRAY, DIG and SORT

There's nothing in potato machinery up to

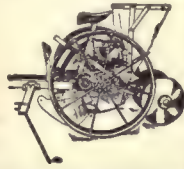
ASPINWALL EQUIPMENT

Write for copy of our free book telling how to make money, growing potatoes.

ASPINWALL MFG. CO.

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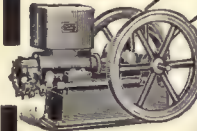


WITTE ENGINES

USE GAS, GASOLINE OR KEROSENE

Are known by a superior standard of construction. 25 years of service has demonstrated their worth. Does work at lowest cost and is always ready to saw, grind, pump, shell or do any farm or shop work.

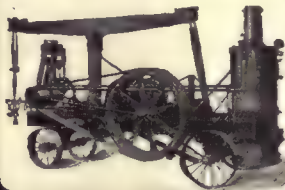
FIVE YEAR BOND GUARANTEE



We build all sizes in stationary or portable type. Hopper jacket or water tank cooling. Inducements to introduce in new localities. Write stating size wanted.

WITTE IRON WORKS CO.
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Well Drilling Machinery



You can make big money making wells. This is one of the few lines of work that are not over crowded. The demand for wells is far greater than can be supplied by the machines now at work. Well Drillers command their own prices. We build the celebrated HOWELL line of Well Machinery, for making deep or shallow wells of all sizes, for all purposes and in all kinds of ground. Our machines are the most up-to-date on the market, contain all the latest improvements, are extremely strong and simple, do perfect work, are easily operated and are very FAST WORKERS. Write to-day for our free Catalog A. 3

R. R. HOWELL & CO., Minneapolis, Minn.

Elkhart Buggies

are the best made, best grade and easiest riding buggies on earth for the money.

FOR THIRTY-SEVEN YEARS

we have been selling direct and are The Largest Manufacturers in the World selling to the consumer exclusively. We ship for examination and approval, guaranteeing safe delivery, and also to save you money. If you are not satisfied as to style, quality and price you are nothing out.

May We Send You Our Large Catalogue?

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Save
\$30



The U. S. Government is Spending Millions of Dollars Annually to
RECLAIM the WET Lands by DRAINING
CONVERT the DRY Lands by IRRIGATING



For the "LAND'S SAKE!" when are you going to Drain or Irrigate that farm of yours? You don't need a surveyor. Get a **BOSTROM IMPROVED FARM LEVEL** and do the work yourself. Simplicity, Accuracy, Durability, Guaranteed. **This Level is no makeshift.** It has Telescope with Magnifying Lenses, enabling you to read the Target a quarter of a mile away; and is used and endorsed in every State in the Union. **Satisfaction guaranteed or your money back.** Shipped on receipt of price, \$15.00, or, if preferred, will ship C. O. D. **subject to examination.** Outfit includes Level, Tripod, Graduated Rod and Target, full instructions and a copy of Bostrom's Book "Soil Salvation" of 25 years experience in draining and irrigating. Send your order TODAY to—

BOSTROM-BRADY MANUFACTURING CO., 1119 Pine St., St. Louis, Mo.



P & O

Beet Implements

We are Pioneers in the Manufacture of
Beet Plows, Seeders, Pullers
and Cultivators.

and have given special attention to the mechanical requirements of sugar beet culture. Our experts in all the beet growing sections have studied the subject thoroughly, and we offer the finest line of beet implements on the market. P. & O. Beet Tools are the simplest, the strongest, and the easiest running made, and they meet the exacting demands of all sections. These implements have every adjustment and convenience, and the Cultivators can be furnished with various attachments for every kind of work.

Send for our Special Catalog on P. & O. Beet Implements.

Insist on getting P. & O. implements from your dealer, or write to us. A Beautifully Illustrated Pamphlet, and a P. & O. Catalog, will be mailed free. Write for Catalog No. G151

Parlin & Orendorff Co., Canton, Illinois.

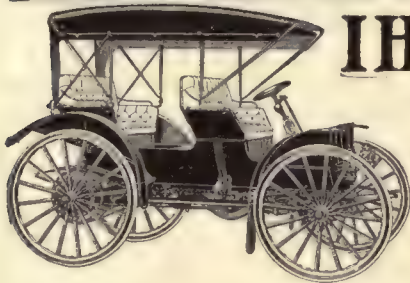
LET WESTERN STATES SPEAK.

Now that Mr. Garfield has committed himself and the anti-Ballinger following of Pinchot's to opposition to Taft's proposed \$30,000,000 irrigation bond issue, the Great West feels anew the heavy hand of Pinchotism that has locked up vast areas of tillable land from settlement and that now would allow great tracts of arid land to remain desert for want of a relatively small bond issue.

This business is opening the eyes of the West to the knowledge that the whole Pinchot-Garfield-Glavis scheme is directed by Eastern influences that care nothing for Western aspirations for progress and would keep the timber regions of the West a wilderness and the arid regions a desert.

President Taft and Secretary Ballinger have urged the bonds as a means of providing funds for completion of irrigation projects, for which sale of public lands does not supply sufficient money, under the national reclamation act. Oregon and Washington know something about the scarcity of reclamation money. Oregon, for example, though one of the largest contributors to the reclamation fund through sale of public lands, gets but small share of the funds for projects in its border. When it asks for its just share, so that reclamation of its arid lands may proceed, it gets the answer: "Wait till adequate funds are available."

The public lands of the West, under the Pinchot anti-settlement policy, no longer are an asset of Western production of wealth. Settlers are barred from agricultural lands both inside and outside reserves, and there is little encouragement of arid land reclamation. It is time that Western states were making themselves heard through their senators and representatives in Congress.—Portland Oregonian.



IHC Auto Buggies Ride Easiest

THE easiest riding vehicles on country roads are IHC Auto Buggies for these reasons:

High wheels protect occupants from jars when going over rocks, clods or bumps. The same size clod or obstruction of any kind naturally offers more resistance to the low than to the high wheel. In plain language, the low wheels must jump over—the high wheels roll over. That's one big advantage of high wheels. It means not only greater comfort but less jar and jolt to the working parts of car.

For Business and Pleasure

this is the ideal vehicle. Simplest to operate, costs less to keep than one horse, travels from 1 to 20 miles an hour over hills, through mud, snow, over any roads. Front wheels are 40 inches high, rear wheels 44 inches. Equipped with roller bearings and solid rubber tires, 1 3/4 inches wide. IHC Auto Buggy wheels do not damage roads any more than the ordinary spring wagon wheels. Solid tires mean no punctures, no "blow out," no delays, no heavy repairing and replacing expense. Full elliptic springs; 36 inches long and 1 3/8 inches wide, also long wheel base, add to easy riding qualities. Send for proofs. Learn what other farmers think of this car. See your local dealer, or write the International Harvester Company of America at nearest branch house for further information concerning this car, and if you are interested in a light delivery wagon ask for information on the International Auto Wagon. This vehicle has the same features of construction as the Auto Buggy and is equally efficient in its service.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

INTERNATIONAL HARVESTER COMPANY OF AMERICA Chicago U S A

(Incorporated)



LOOK FOR THE I. H. C. TRADE MARK. IT IS A SEAL OF EXCELLENCE AND A GUARANTEE OF QUALITY

(Continued from page 312.)

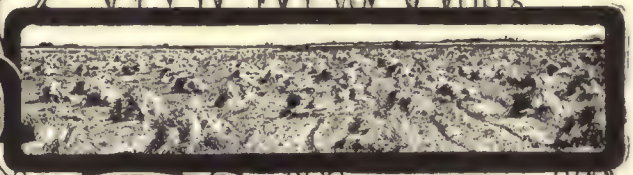
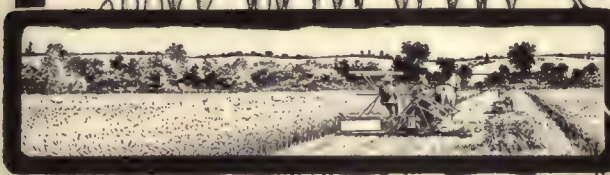
AMENDMENTS to Former Articles.
Add to States that have adopted the "Carey Act."

NEVADA—Address C. E. Deady, State Land Register, Carson City.

In the June issue, Mr. Bohm will present much valuable data with reference to Taxation, School Systems, Right of Suffrage, etc.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.

PREPARE NOW



MAKE THE HARVEST CERTAIN

YOUR time and careful judgment cannot be used to better advantage than in preparing well in advance for the proper harvesting of your grain crops.

Take no chances of delays, with experimental harvesting machines. Don't risk the choice of one or two neighbors, because you must buy for many years' service as well as this year's harvesting.

It is necessary that you be prepared with efficient harvesting machines if you are to reap all the profit that your harvest should yield.

Right now is the time to ascertain whether or not you need a new harvesting machine—binder, mower, reaper, hay rake, tedder—it does not matter so much which machine you need, the principle is the same.

You should start today to look over your equipment—ascertain what you will need.

There are many points to be considered in selecting a harvesting machine. If it is a binder you need, you should have a machine that is efficient, dependable and durable, and then the machine should meet your particular requirements—and to do all this it is necessary that you take sufficient time to properly consider the selection of the new machines.

Buy wisely—safely—on the verdict of thousands of farmers of America and all over the world who have cut out the failures and choose from standard makes of the famous I H C Line of Machines.

**Champion McCormick Osborne
Deering Milwaukee Plano**

Why waste your valuable time—patience—labor, and sacrifice part of your crop this year and every year in experimenting with unsatisfactory machines? Others have taken all the experimental risk for you—if you act wisely now.

Don't wait until you must "buy in a hurry." That is not necessary, because an I H C Dealer is right near you and will, any day, show you just the

I H C machine adapted to your particular needs.

He will also take your reservation order for reliable binder twine on which you should take no risk this year. The late market may be flooded with inferior grades of experimental twine. It's important that you investigate these facts and your I H C Dealer has the details to show you—and the proof of quality on all machines and I H C brands of binder twine.

Then, too, remember that with the strongest and most reliable guarantee given on any machines in the world, you also have the satisfaction of knowing that I H C interchangeable parts are quickly at hand—through your I H C Dealer. No waits. No delays. No annoyance. Perfect workmanship and materials of highest quality are guaranteed by the experience of over half a century in I H C machines. Make your harvest certain.

We urge upon you the importance of deciding this matter now; because, if you put it off until a more convenient time, the chances are that you will never give the subject proper attention. You, no doubt, think there is plenty of time—but the harvest season will be upon you the first thing you know. Therefore, consider this harvesting machine question, now, while you have the time to give it proper study. Write for any information you may need to help you make a wise decision.

Take your choice of machines. The quality is the same in all—the best possible.

Don't experiment with binder twine, either. Get one of the seven perfectly dependable brands of twine and be sure. Choose Champion, McCormick, Osborne, Deering, Milwaukee, Plano or International—in Sisal, Standard, Manila and Pure Manila brands.

If it is not convenient to see an International dealer, write to International Harvester Company of America at nearest branch house for full information and the catalogue you want.

WESTERN BRANCH HOUSES: Denver, Colo.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

INTERNATIONAL HARVESTER COMPANY OF AMERICA

(INCORPORATED)
CHICAGO U S A



When writing to advertisers please mention The Irrigation Age.

Why Is It That No Man Ever Buys One

THE cheap little car, fresh from the factory, looks spick and span, and seems to promise its buyer a great quantity of enjoyment, but—When that buyer gets his *next* car, he *does not* get one of those cheap little cars.

Why?

Not because he likes to spend more money.

But because he wants to *save* money.

• • •

Think that over.

It means something.

• • •

If a new car costs \$1500, and one year's repairs cost \$500, the price of that car is really \$2000.

If this \$2000 car is in the repair shop, getting fixed up, three days a month, its owner is losing one-tenth of its service, or \$200.

This car, therefore, stands its owner \$2200 the first year, although it cost only \$1500 to begin with.

• • •

And in using this cheap little car its owner never knows when something is going to break and leave him stranded miles from home.

Being a cheap car, it can't climb hills like a good car, it lacks the speed of a good car, it hasn't the size, style and beauty of a good car, and wherever the owner goes with it, it advertises him as a *cheap* buyer.

That's why no man ever buys one of these cheap little cars a *second* time.

• • •

If a car isn't worth buying a second time, it *isn't* worth buying at first.

And the buyer who recognizes that fact before he buys any car at all, saves himself much expense, much disappointment, and much annoyance.

• • •

If you are planning to buy a motor car, read every word of this advertisement.

• • •

We have made motor cars continuously since 1896. Mr. Winton made and sold the first gasoline car produced in America. He has made and sold more first-class cars than any other single manufacturer. And we have on our books the names of men who have bought as many as six or eight of our cars. One buyer, Mr. L. R. Speare, president of the American Automobile Association, has owned and used 16 different cars of our manufacture.

It is because Winton cars are right in the first place—right in material, workmanship, power, style, beauty and cost—that once a man buys a Winton he will never be satisfied with any other make.

• • •

One reason why this is true is that the Winton car stands up under hard use with a smaller repair expense than any other car on the market.

Sworn testimony of 20 Winton owners (we send you their names and addresses upon application) show that 20 Winton cars have run 184,190 miles on \$142.43 repair expense.

That distance is more than seven times the distance around the earth at the equator.

And each car's average repair expense for 1000 miles is 77 cents.

That's a world's record that touches the pocket book of every automobile owner.

Compare that record with the expenses of the owners of other cars—right in your own neighborhood.

• • •

This wonderfully low expense record of Winton cars shows they are right in the first place—right in material, workmanship, quality, performance, right in everything that makes an automobile worth while.

• • •

And because they are right in the first place, Winton cars last longer than any other car on the market.

There are any number of Winton cars made as far back as 1896 still doing daily service in this country.

No other maker has a record to compare with the Winton record.

• • •

And because Winton cars stand up indefinitely, and run at less expense than other cars, it follows that a Winton car is always a good purchase, no matter how old it may be.

For the quality is in the car itself, and it stays there.

If the quality isn't in the car in the first place, you can't put it in.

And that's why the buyer of a cheap little car never buys a second time.

Because it depreciates so quickly that what little merit it once possessed is soon gone, and the car is worthless.

• • •

We realize that there are many buyers who hesitate to put in a first car as much money as we get for our 1910 model—\$3000.

But we want the trade of these buyers just the same, because we know that once they become acquainted with Winton merit they will be the best salesmen for Winton cars we could get.

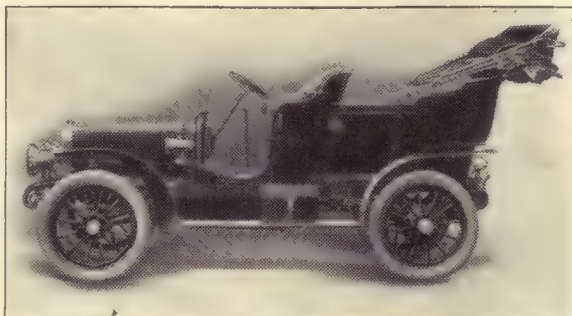
So we have devised a plan where the man who doesn't spend \$8000 can still get a Winton car, and be in the class of first-grade buyers and satisfied owners.

• • •

This is the plan.

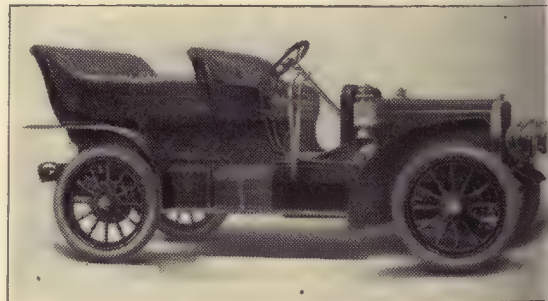
Some of our buyers want a new car every year—in order to have the very latest style of body, the latest thing in fancy trimmings, the like.

These buyers turn over their used cars in part payment for new ones.



WINTON MODEL K.

Four-cylinder, 30 H. P. motor, $4\frac{3}{4}$ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Floating type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Three brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels running on roller bearings. 34×4 -inch tires. Wheel base 102 inches. Gasoline tank 15 gallons. Five-passenger body. Original price \$2500. Bargain price, \$500 to \$800.



WINTON TYPE X-I-V.

Four-cylinder, 30 H. P. motor. $4\frac{3}{4}$ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Floating type rear axle. Forged steel front axle. Screw and nut steering gear. Three brakes. Pressed steel frame, Winton Twin springs. Best hickory wheels, running on ball bearings. 34×4 -inch tires. Wheel base 104 inches. Gasoline tank 22 gallons. Five-passenger body. Original price \$2500. Bargain price \$700 to \$950.

Use Cheap Little Cars a Second Time?

In the past it has been our custom to sell these used cars to city "just as they stand." We have changed our policy—in order to get your trade.

Take these cars into our factory, replace worn parts, tune up to top-notch running condition, revarnish the body (sometimes it an entirely new coat of paint), and offer this car to you at what it costs us. Our policy puts you in possession of a high-grade car at an exceptional price and makes you an enthusiastic advertiser of Winton.

Remember this: If you ever buy a Winton car from the Motor Carriage Company, and it is not exactly as represented, we give you your money back without bickering or delay. OUR MONEY BACK is something no other automobile maker can give. We make the proposition because we know we have the best skill and experience and facilities can produce.

Look over the bargains offered on this page. Pick out one that interests you, and write us about it. This involves no obligation on your part whatever.

We will write you, describing the car in detail, tell you what it has in the way of top, glass front, speedometer, if any (some cars are sold without these equipments), and will make you a rock bottom price that will interest you.

And note this: You are not obligated in any way. We never ship a car to a prospect and try to force him to take it, when he has only asked for information.

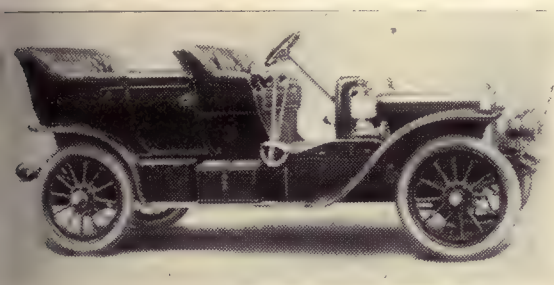
The Winton Motor Carriage Company doesn't do business that way. If after we have told you exactly what we have, you decide to look the car over, we will arrange for a demonstration before you put down a cent. Even then there is no obligation on your part. You needn't buy at all unless you are ready to buy and unless you are satisfied. And even if you do buy, remember we say: "Your money back if the Winton car is not as we have represented it."

Look over these bargains and write us today. We urge prompt action because our stock is limited and spring orders are generally more numerous than we can fill.

THE WINTON MOTOR CARRIAGE CO.

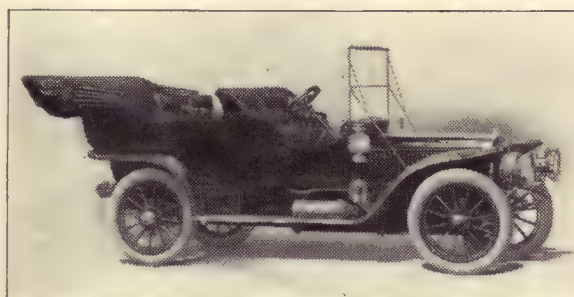
Licensed under Selden Patent.

86 Berea Road, Cleveland, Ohio.



WINTON MODEL M.

Four-cylinder, 40 H. P. motor. 5 inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Multiple-disc clutch and four-speed selective-type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton twin springs. Best hickory wheels, running on roller bearings. 34x4-inch tires. Wheel base 112 inches. Gasoline tank 22 gallons. Seven-passenger body. Original price \$3500. Bargain price \$1100 to \$1400.



WINTON SIX-TEEN-SIX

Self-kranking, six-cylinder, 48 H. P. motor. 4½ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magneto and storage battery. Hancock mechanical oiler. Multiple-disc clutch and three-speed selective-type transmission. Clutch and transmission run on ball bearings. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 36x4½-inch tires. Wheel base 120 inches. Gasoline tank 22 gallons. Seven-passenger body. Original price \$4500. Bargain price \$1600 to \$2000.



WINTON SEVENTEEN.

Self-kranking, six-cylinder, 48 H. P. motor. 4½ inch bore. 5-inch stroke. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magneto and storage battery. Mechanical force-fed lubrication. Multiple-disc clutch and three-speed selective type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4-inch tires in front, 34x4½ tires in rear. Wheel base 120 inches. Gasoline tank 22 gallons. Five-passenger body. Original price \$3000. Bargain price \$2000 to \$2500.

The Winton Motor Carriage Co.

86 Berea Road, Cleveland, Ohio.

Send me information about one of your Model used cars, selling at about \$..... This request involves no obligation whatever on my part.

Myers Power Pumps

Working Heads, Pumping Jacks, Cylinders, Etc.

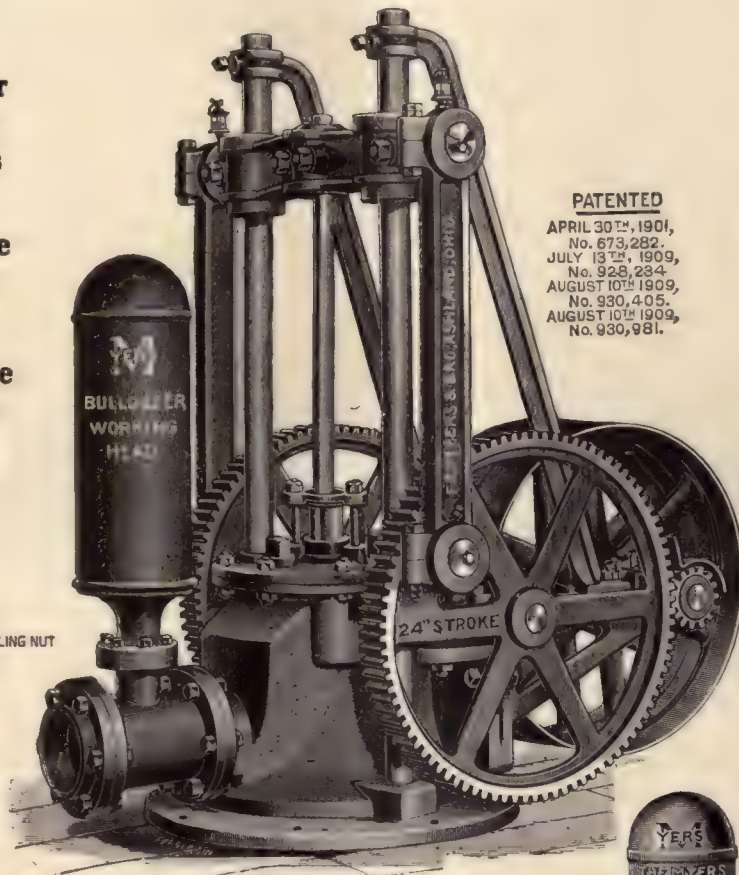
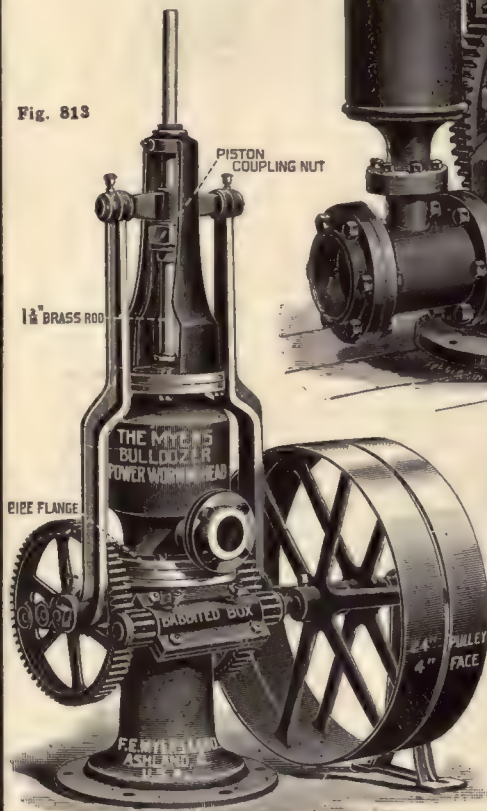
PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches

Fig. 813



PATENTED

APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,284.
AUGUST 10TH 1909,
No. 930,405.
AUGUST 10TH 1909,
No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

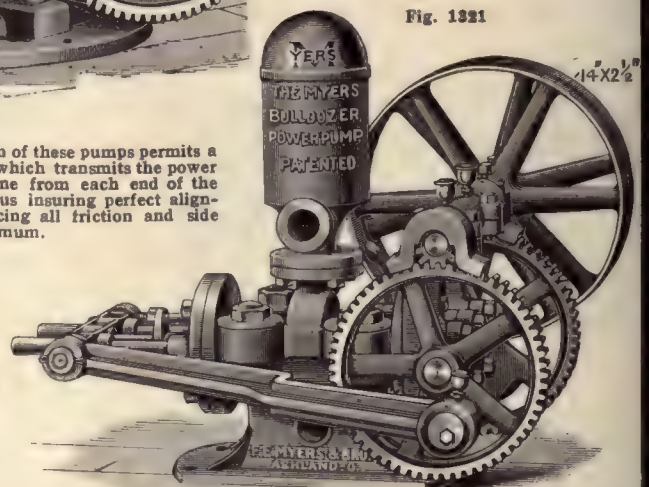
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

Fig. 1321



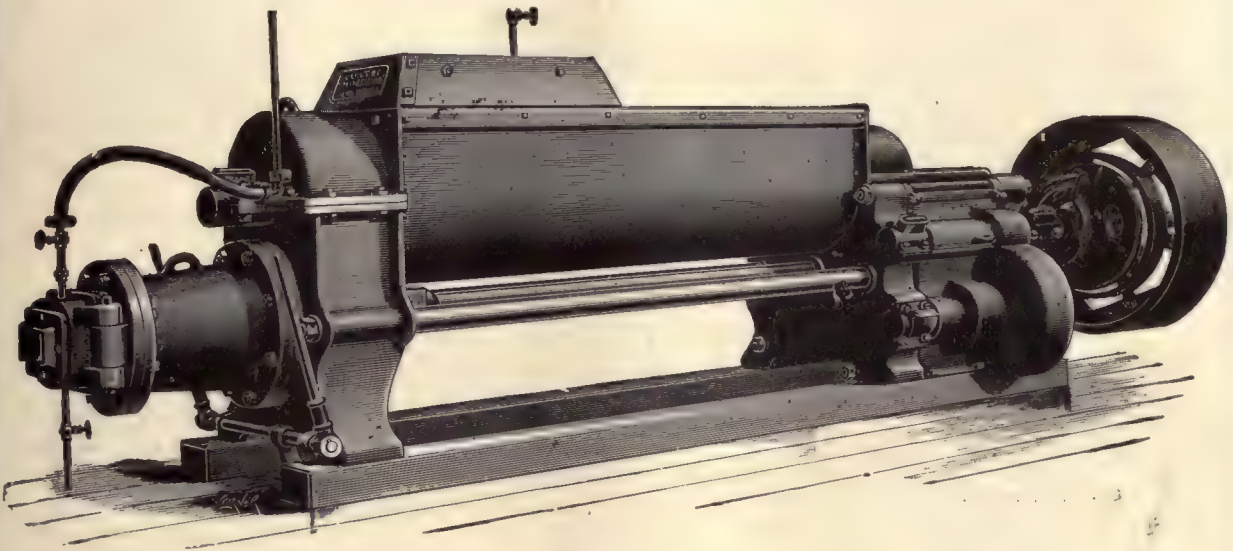
The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

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Catalogue
and
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ASHLAND PUMP AND HAY TOOL WORKS

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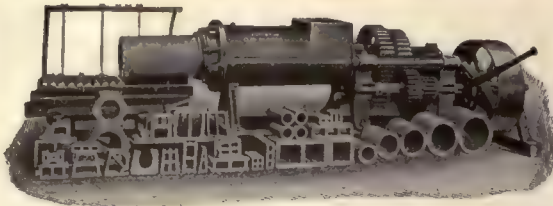
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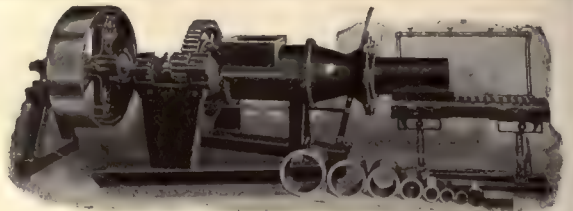
If interested write us for particulars and estimates.

E. M. FREESE & CO.
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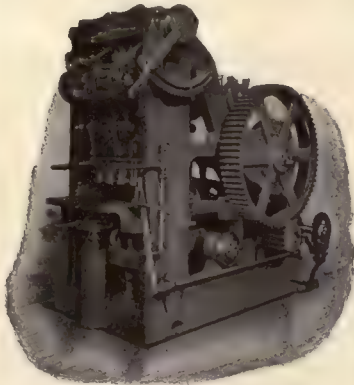
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Centennial Auger Machine



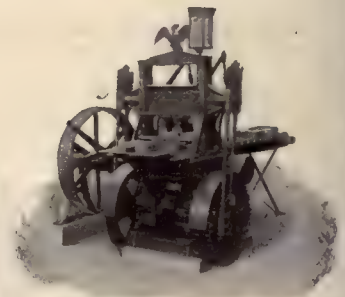
Mascot Auger Machine



Dry Press, 5 styles



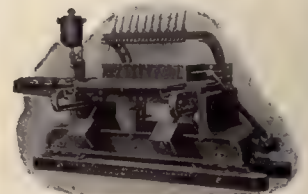
Wheelbarrows and Trucks



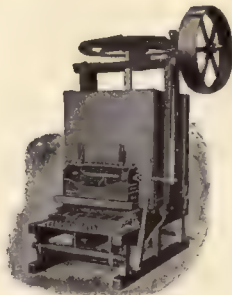
Eagle Repress



Dry Cars, all kinds



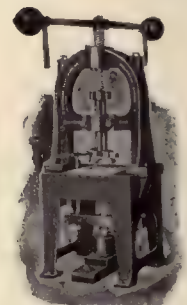
Hand and Power Cutters



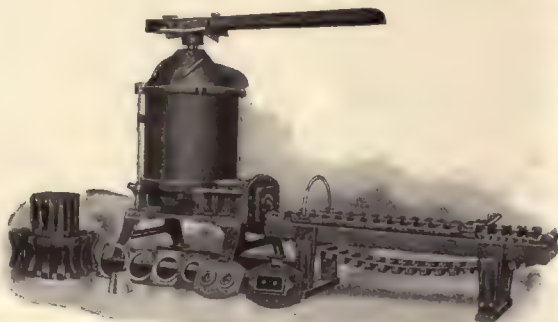
Soft Mud Machines, Horse and Steam Power



Disintegrators



Hand Power Screw Press



Horse Power Plunger Machine



Products of our Auger Machines

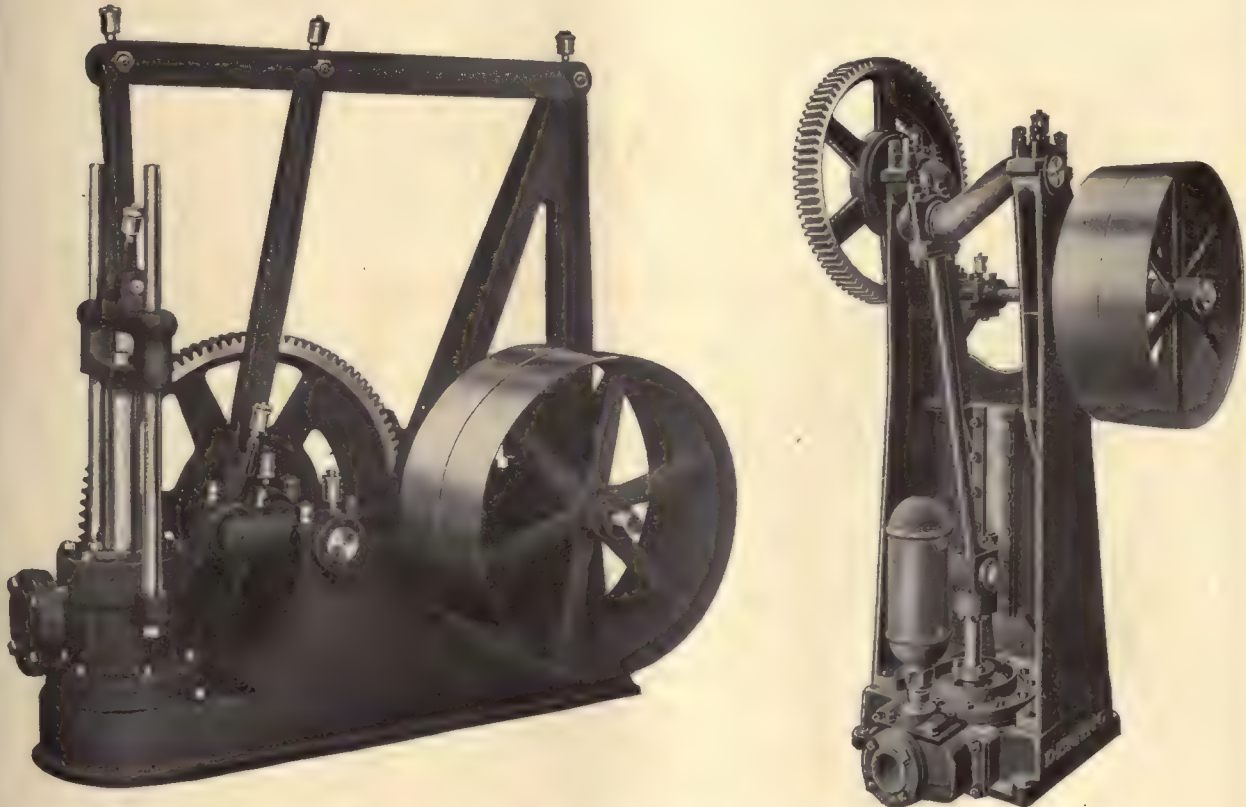
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RUN RIGHT"

We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

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These Working Heads Can be Operated by Electric Motor, Gas or Gasoline Engine, Steam Engine or Belt Driven—the Motors and Engines being Direct Connected if Desired.

The chief advantage to the possessor of a Deming Deep Well Working Head is in the immense saving of power money in direct proportion to the great depths from which the water can be pumped.

Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

THE DEMING COMPANY, SALEM, OHIO

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Including Spray Pumps, Nozzles and Accessories

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and Professional Men.**

**Growing Towns and Cities. Large
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under irrigation, furnishing Land and
Homes for thousands.**

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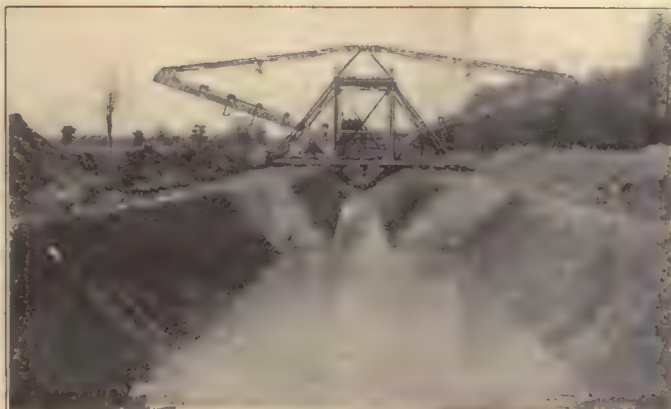
VOL. XXV

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NO 8

CHICAGO, JUNE, 1910

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Ditch Being Dug with Sloping Banks—An Austin Drainage Excavator Ditch.

is the cry of every drainage and irrigation expert. You are not putting in a system for this year only, but all the scores of years that will come to you. **There is but one way** to make a permanent ditch, and that is to carve it with sloping banks from the natural soil. A ditch dug in any other way will cave and fill up. **There is only one machine—the**

AUSTIN DRAINAGE EXCAVATOR

that will dig a ditch with sloping sides in one operation. There is no other machine that will produce a finished ditch so cheaply.

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OUR FULL LINE COMPRISES
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We Sell Outright or Lease Drainage Machinery

F. C. AUSTIN DRAINAGE EXCAVATOR CO.,

Railway Exchange
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55 YEARS' EXPERIENCE

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CENTRIFUGAL PUMP AND GASOLINE ENGINE IRRIGATION OUTFIT.

The Temple Water Elevators -- The Temple Centrifugal Pumps

Manufacturers of all kinds of Hand and Windmill Pumps

Also Manufacturers Single Cylinder, Double Cylinder and Four Cylinder Gasoline or Kerosene Engines

Briefly stated the advantages of our Double Cylinder Engines are as follows:

First—They are more economical in the use of fuel. On light loads one cylinder can be used, reserving both cylinders for heavy loads.

Second—Although weighing about one-half the weight of a single cylinder engine of same rated capacity, vibrations are practically overcome, demonstrating conclusively that in proportion to strain the double cylinder "Master Workman" is the stronger engine.

Third—The heavier weight of a single cylinder engine is due to the fact that it must have heavier fly-wheels in the horizontal type, and a longer, higher and consequently much heavier base than is required for the "Master Workman." The heavier the fly-wheels the greater the strain on the crankshaft, so you will realize that neither heavier fly-wheels or a heavier base contribute one iota to the strength of a single cylinder engine.

Fourth—When vibrations are overcome, as in the "Master Workman," the lighter the engine and the less cumbersome it is, the greater its sphere of usefulness and the cheaper and more convenient it can be handled.

Fifth—Lubrication in our engine is absolutely perfect. There is no forced lubrication, lubrication being by gravity. Certainty of lubrication is of vital importance in the steady running and operation of a gasoline engine.

Sixth—All mechanism is in full view, which will enable you to thoroughly understand the operation of a gasoline engine. The worst kind of complexity is concealed mechanism.

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Factory, 15th St. and 15th Place, near Canal St.
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Cut of fruit from the Willow River Valley in Malheur County, Oregon,
showing that we are free from frosts.

THE above photo was taken from specimens cut from an orchard May 14th, 1910, and to the experienced Fruit Grower speaks louder than any words.

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Don't fail to take advantage of this opportunity to secure a town lot or acre tract in this thriving young city, and a ranch in this fertile, beautiful fruit valley.

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OREGON FRUIT FARMS CO.

BROGAN, OREGON or BOISE, IDAHO

HERE IS A DEEP WELL INSTALLATION
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AMES DEEP WELL PUMP

TWENTY HORSE POWER ENGINE12 INCH WELL 200 FEET DEEPPUMP 150 FEET LONG

DELIVERS AT SURFACE 400 GALLONS PER MINUTE



WE MANUFACTURE **PUMPS** FOR EVERY SERVICE

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 half inch to thirty-six inches, made of the best

Oak Tanned California Leather

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True Temper



Alfalfa Forks

THESE Forks are made expressly for the purpose, in different sizes and with handles from 4 ft. in length upwards.

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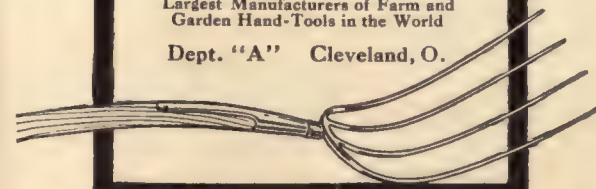
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Write for our free booklet "Tools and Their Uses." It tells how True Temper Tools are made and how there is a True Temper Fork, Hoe or Rake for every use on farm or ranch.

American Fork & Hoe Company

Largest Manufacturers of Farm and Garden Hand-Tools in the World

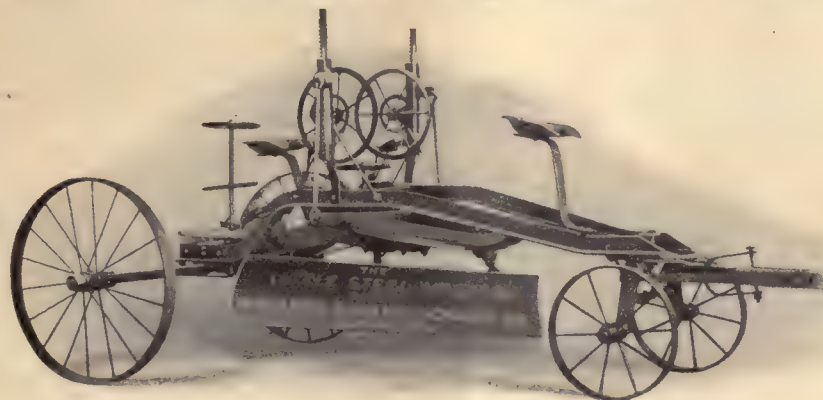
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TRY ONE AT OUR EXPENSE

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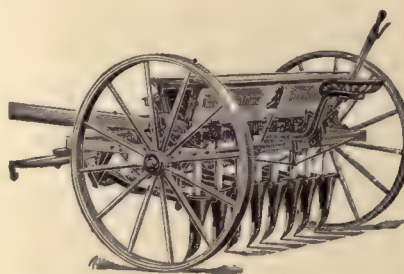
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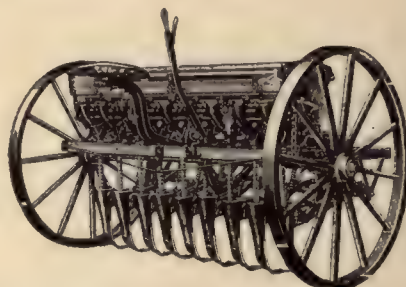
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Twenty-fifth Year

THE IRRIGATION AGE

VOL. XXV

CHICAGO, JUNE, 1910.

No. 8

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

SUBSCRIPTION PRICE.

To United States Subscribers, Postage Paid, . . . \$1.00
To Canada and Mexico, . . . 1.50
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Official organ Federation of Tree Growing Clubs of America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 25 years old and is the pioneer publication of its class in the world.

Irrigation Age Has Prosperous Year.

The IRRIGATION AGE is desirous of calling the attention of its readers to the fact that its advertising patronage has nearly doubled within the past twelve months. The advertising record to date of the IRRIGATION AGE, the Official Organ of the National Irrigation Congress, is as follows: April, 1909, there were carried in its columns 5,880 lines; in April, 1910, this had been increased to 10,766 lines, showing an increase of nearly 5,000 lines in one year.

Of this increase, 1,248 lines represent the expansion of old advertisers. This is a significant fact, and should be given careful consideration by wise investors in advertising space.

The IRRIGATION AGE grows because it reaches the best buying public in the world today—the irrigation farmer. Sure of water, sure of crops, sure of revenue from his land, he spends his money for what he needs, and if you have anything to sell him, whether it be agricultural implements, accessory lines or general household necessities, the AGE will reach an army of buyers.

Laterals Filled; Burley Rejoices.

Water having finally been turned into the laterals at Burley, Idaho, by the Reclamation Service, the whole territory is rejoicing. People of Burley are to be congratulated that they have at last secured water for their land, but the name of Burley will always recall to mind a distinct case of mistreatment by some of the government officials of people who entered on the land near that townsite in the early days of governmental activity in that vicinity. A million of dollars was spent in building a dam across Snake River, which promised the distribution of thousands of acre feet of water for land below it.

Many of the active men who went into the Burley country in the early days were forced to retire after it was learned that there was no provision made for the distribution of water upon this tract.

The editor of this journal visited Burley at one time when a meeting was held to discuss the subject with a government official, who has since retired, and the treatment given settlers at that time was instrumental in turning them against the government and governmental methods in handling large projects. Settlers who have remained on the Burley tract are to be congratulated, not only for their patience, but good judgment, as they will no doubt all do well under the new system and distribution of water.

Enemies Continue Abusive Campaign.

Interests which have been opposing Secretary Ballinger are still at work through the various press bureaus in Washington, circulating the statement that the Secretary will resign, as soon as the investigating committee reports. This is the usual Pinchot-Garfield policy, and while these two publicists are not as bold as they were under the Roosevelt regime, they are still active, and trying in devious ways to undermine and discredit the present administration. It is an open secret that both Garfield and Pinchot, and even some of the reclamation officials, are working to injure the president, in the "third term" interests of Colonel Roosevelt. If these men were wise they would keep their fingers out of this pie. They will do Colonel Roosevelt more harm than good before they are through with it, and they will do little injury to President Taft.

The history of his administration has yet to be written, and the AGE predicts some wonderful things for President

Taft before the end of his term. The fact of the matter is that he is so strong a man, and so kindly disposed to his fellow-men, that he is slow to detect their weaknesses or their intrigues, as was shown in the case of Pinchot and some others. It is safe to say that he has backbone enough to act decisively at the right time. Some of the men who are criticising and fighting the president now may have occasion to regret it before the end of his present term.

**Suggest
Water
Payments
in Autumn.**

The attention of the IRRIGATION AGE has been called to the fact that the payment, which falls due annually, for water-rights under the Reclamation Law, is collected in April of each year, and this, it appears, is a most inopportune time at which to burden colonists and beginners in irrigation farming.

Would it not be well for the Interior Department to consider some means of making the time of payment October, November or December, after the settlers have disposed of their money crops?

Many of the farmers throughout the irrigated west wish to make improvements as rapidly as possible, and in many instances they no doubt spend the money which they had hoarded for payment on the water-right.

Without close scrutiny of the irrigation law and its numerous restrictions, it is the impression of the IRRIGATION AGE that some provision may be made whereby the farmers under the federal projects may be permitted to make their payments in October or November.

This is worthy of careful investigation on the part of the proper officials, but if there is a change it should be inaugurated by the Interior Department rather than through that branch of it known as the Reclamation Service.

**Secretary
Wilson's
Forestry
Policies.**

Secretary of Agriculture Wilson has taken a firm stand on the matter of adding to our national forests, this stand being in favor of the settler, and the Secretary will hereafter investigate, personally, all grievances brought to his attention and concerning the curtailment or restriction of individual rights along the borders or inside of forest reserves. The Pinchot policy, it is said, has been abrogated and a more progressive method has been instituted for the benefit of the West. Judge D. C. Beaman, of Denver, who recently returned from Washington, states that the *Washington Post* of April 21st contained a column interview with Secretary Wilson, in which it was stated that the Pinchot policy as to homesteaders and miners is not only to be discontinued, but a policy, the very reverse of it, is to be immediately put in operation.

Judge Beaman called upon the Secretary and directed his attention to the article. He inquired if it were true, and if the present forestry officials could be expected to change their former attitude inasmuch as the Pinchot policy of holding every acre within forest reserves had so permeated the service, even to rangers, that he feared it would be to some of them like turning a somersault backward.

Secretary Wilson replied that the matter contained in the article was true; indeed, that more was true; that he was hereafter going to give his personal and almost exclusive attention to forestry conditions, and that any homesteader with a grievance could write and be assured of prompt and careful investigation of his complaint.

This clearly indicates that every homesteader now has a real friend in authority. Heretofore, Pinchot's "pull" with the Roosevelt administration made it difficult for Secretary

Wilson to carry out views without direct conflict with the president. All this has been changed, and it is clear that henceforth the Secretary of Agriculture, under whose department forestry operations are conducted, will dominate the situation, rather than be dominated by the forestry head.

This is as it should be. No self-respecting cabinet officer or head of a department could tolerate the Pinchotian condition of interference.

**Warren
Bill
Passes
Senate**

The bill presented to Congress last April by Senator Warren authorizing the disposal of surplus waters upon Government Reclamation projects, has been approved by the Senate and now stands favorably reported in the House of Representatives. It is hoped by the sponsors of the measure in the House to secure its consideration and adoption before the adjournment of Congress. On another page we reproduce the bill, together with the reasons advanced by the Secretary of the Interior for its recommendation and some trenchant arguments in its behalf, advanced by Senator Borah of Idaho in the course of a masterly argument in the Senate.

The bill has been most carefully drawn and a critical study of it refutes every objection that could be urged against it as a possible attempt to curtail or to interfere with the administrative power of the states with reference to the waters within their borders. In the present unhappy state of many of the Government projects due to the lack of funds, and with the "Reclamation Bond Issue" still knocking at the door of Congress, the measure, if enacted into law would prove a godsend to many a settler now steeped in pessimism. It would enable the Government to deal with settlers who may have organized themselves into a corporation or district or who may conclude to go under the Carey Act. In such a case, the Government might release a portion of the project and dispose of the necessary water already impounded or appropriated.

The so-called "North Side" section of the Boise-Payette project in Idaho, is an instance in point. The settlers there, tired of the interminable delays, could organize an irrigation district and take the water claimed by the Government for the part of the project. The Reclamation Act has always worked a hardship in that it compels the Government to deal with individuals alone and not in a corporate capacity. It remains with the settler in every case to decide which course to adopt. Pressure should be brought to bear to urge the passage of this measure upon the members of the House of Representatives.

**Summer
Tourist
Rates to
Pueblo.**

In discharging his duties as Secretary of the Board of Control of the Eighteenth National Irrigation Congress, Mr. Ralph Faxon has nowhere exhibited more clearly his ability to get gratifying results, than in his success in consummating an agreement with the Western Passenger Association, whereby tickets to the Irrigation Congress will be sold at summer tour rates from eastern points. Eastern people will thereby avoid the necessity of purchasing new tickets in Chicago; i. e., buying a ticket in the East to Chicago, and another at Chicago for Pueblo and western points.

Unquestionably, this agreement will be an active agent in promoting the interests of the congress in eastern and central states. New York had a substantial delegation at Spokane last year, and this has encouraged the Board of Con-

trol to believe that this year, with only half the distance to travel, there will be a much larger attendance from that state.

Larger delegations from the South are also anticipated. Exhibiting a keenness and alertness, second only to that found in the West, the southern people are willing to travel long distances to gain information that may be of value in their home industrial development. Last year a special train-load from Florida, headed by Governor Gilchrist, attended the Congress at Spokane.

Citizens of Pueblo, as well as the officers of the Congress, are deserving of a generous measure of credit for the work which has already been accomplished toward exciting wide interest in the Pueblo gathering.

The IRRIGATION AGE is preparing to issue three mammoth special editions in the months of July, August and September, to boom the Congress. At its command, at the present time, are many excellent photographs and illustrations, as well as a great mass of interesting information about irrigation and the West—all of which will be used in making these editions attractive. It is proposed to issue editions that will rival, if not surpass, the elaborately illustrated Irrigation Congress number of May, 1909.

Land Entry Contest Reaches Decision.

A decision of more than ordinary interest is that handed down by the Register and Receiver of the Boise (Idaho) Land Office recently, in the case of a contest of a Desert Land Entry, for insufficiency of proof, and which, if sustained upon appeal, will result in the cancellation of a large number of desert land entries in the vicinity of Mountain Home. The crux of the decision is that water rights sold by the "Great Western Beet Sugar Company" (now defunct), are insufficient to offer as proof unless it can be shown that the company was actually established in its right to waters deeded. The decision states:

"It is an established principle, that persons making a purchase of this kind are charged with knowledge of conditions affecting the validity of that which they thus seek to secure. If this water-right is not such a valid right as is required by law in desert land entries, then this expenditure was not valid, even though the contestee may have made the payment in good faith—the abstract of title does not show that the company had any water to deed—it issued a deed to Altschul and Altschul issued a deed to Dearing.

"The supposition, of course, is that the company had some water, but it appears from testimony that it never had enough to irrigate even the limited acreage upon which crops had been planted. Therefore, it does not seem possible that it could have had enough water, when issuing this deed, to supply land that was outside the small cultivated section and far beyond the reach of any constructed canal system. The company issued a warranty deed, \$800.00, for a 40-acre right, to Altschul and Altschul issued a quit-claim deed to the contestee for half the right, securing from her \$600 in cash.

"It will be observed, further, that Altschul has refused to state whether he paid the company in cash (as required by law), nor would he make any statement as to the manner of payment. It is significant that he quit-claimed a portion of the alleged right secured under warranty from the company. Under the regulations desert entrymen—if they rely upon the purchase of water-rights—must, also, produce a sworn showing from the company of the amount of water controlled by it, and the amount it has disposed of. It is not proposed that paper rights shall be used in making proof unless those rights have absolutely valid foundation.

"In this case there is nothing to show that the company had anything to sell to Altschul.

"Upon the evidence we are obliged to conclude that this so-called water-right was not valid—that it did not have such a foundation as is contemplated by law.

"When an entryman makes payment on a water-right, whether that right be purchased direct from the company proposing to furnish the water, or from someone to whom it has already made a transfer, the supposition is that the money, directly or indirectly, goes toward the construction of a system for supplying water. We are justified in assuming that Altschul did not pay this company in cash. At the time he gave his testimony he knew what the department requires, and his refusal to answer justifies the inference, that cash payment was not made, and, in such case, the cash payment made to him, by this entrywoman, was not a payment toward the reclamation of this land, that is, the money did not, directly or otherwise, go toward the construction of an irrigation system.

"We hold the allegations of the affidavit of contest have been sustained and the entry should be cancelled."

Amendment Prohibits Speculative Filings

One of the most important measures adopted by Congress at its present session is the amendment to Carey Act Statutes introduced by the Honorable Frank M. Mondell, Chairman of the House Public Lands Committee and known, officially, as "House Resolution 21428." The purpose of the act is well expressed in the report of the Committee of Public Lands recommending the passage of the bill in which it is stated, verbatim:

"The advisability of legislation providing for temporary withdrawals of lands, the irrigation of which is contemplated under the Carey Act, has been referred to at various times by officials of the Interior Department.

"The necessity for the legislation arises from the fact that when the state, or its agents, proceed to the survey, platting, and mapping of a given area with a view of applying for the segregation of the same under the Carey Act, there is very likely to be filings made on the land, more or less speculative in character, the effect of which has been, in some instances, to entirely defeat the successful carrying out of an irrigation project.

"Various Secretaries of the Interior and Commissioners of the General Land Office have had their attention called to this condition and have from time to time suggested legislation which would remedy it by authorizing the secretary to make temporary withdrawals of areas within the limits of which it was proposed to segregate lands with a view of reclaiming them under the Carey Act. The bill now reported is intended to meet this condition."

The act, as approved, reads as follows:

"An act authorizing the Secretary of the Interior to make temporary withdrawals of public lands for certain purposes.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that to aid in carrying out the purposes of Section 4 of the act of August 18, 1894, entitled, 'An act making appropriations for sundry civil expenses of the government for the fiscal year ending 1895, and for other purposes,' it shall be lawful for the Secretary of the Interior, upon application by the proper officer of any state or territory to which said section applies, to withdraw, temporarily, from settlement or entry, areas embracing lands for which the state or territory proposes to make application under said section, pending the investigation and survey preliminary to the filing of

the maps and plats and application for segregation by the state or territory: Provided, that if the state or territory shall not present its application for segregation and maps and plats within one year after such temporary withdrawal the lands so withdrawn shall be restored to entry as though such withdrawal had not been made." Approved March 15, 1910.

This amendment will correct an evil with which the execution of Carey Act plans has been hampered from their inception. Persons who may have come into possession of the plans of the projectors have, heretofore, made inroads upon the tracts to be reclaimed, and filed upon the choicest sites under Homestead and Desert Land Laws. The effect, has been not only to hamper the companies, as stated, in their legitimate operations, but to prevent Carey Act Entry-men from enjoying the right of free selection.

This measure has been strongly urged upon Congress by Secretary Ballinger at various times and since its enactment, the General Land Office has issued regulations for carrying it into effect.

Movement Toward Canadian Northwest.

During the past four or five years there has been a heavy movement of colonists toward Canada. This was brought about by the sagacious advertising of some of the railway companies operating in that country, and, while the effort on the part of the railway officials is commendable, in a way, as an attempt to develop their territory, much criticism has been expressed concerning the matter of misrepresentation of the possibilities for home-building in the Canadian Northwest.

Frequently word reached the AGE from people who have been led to invest their limited savings in that country, and who have found upon settling there, that conditions have been misrepresented, and that they were wholly at the mercy of the Canadian Trans-continental lines, traversing the provinces in which they located. This would not be so serious a matter, and would no doubt, be corrected later by proper legislation, were it not for the fact that great claims have been made as to quick money crops, and these statements have not materialized. The result is that there are hundreds of settlers, in the Canadian northwest today, who have spent their available funds, and are now "on their uppers" without any possible way of reaching a safe position in the work of home-building.

Is it not time that the United States government or some of the private land companies, investigate the situation. An attempt should be made to supply facts.

The agricultural, as well as daily press, of the United States has carried large and flaring advertisements, setting forth the claims of Alberta and Saskatchewan, and have published editorial reports of the immense crops. Obviously many of these reports have been misleading.

The press bureaus of the various Canadian railways are well conducted institutions. The heads of the bureaus are located in Canada, while they have bright advertising and editorial writers in "the States," who are continually working the papers for reading matter space, in connection with display advertising. This campaign has been so well conducted that, it is safe to say, 100,000 people will have gone into Canada during the year ending July 1, 1910, and it is claimed by Canadian publications that this number of people have taken in, to aid in the development of that country, from seven to ten million dollars.

There can be no serious objection offered to a man going into a country where he may do well, whether it be Australia, Ceylon or Russia, provided he is certain about the

result, and that the people who induce him to migrate are honest in their statements. It is, however, an entirely different matter, to entice a man twelve or eighteen hundred miles, permit him to expend all his available money, and then not "make good."

The writer has met several people throughout the West, particularly in Colorado, Wyoming and Idaho, who have returned from Canada during the past year or two, so thoroughly disgusted with it, that they could not be induced to go there again on a guarantee.

It is time for some of the states of the West, and the large land holders, to take this matter up, and give the actual facts to prospective Canadian colonists, who could do so much better on this side of the line.

The Canadian policy of colonization is good, and the Canadian government is a clean, paternal institution, but it is a government for the classes, rather than for the masses. It has continued along this line for so long a time that the masses are satisfied with the situation and are willing to accept small returns for their labor, while the governing class, composed of bond holders, and the heavy land owners are sapping the life-blood from settlers.

The writer was told, on a recent western trip, that the railways of western Canada, absolutely dominate the crop situation; in fact, handle it as some of the eastern roads do the fruit crop, charging a very high rate when the crop is light, and an exceedingly low rate when a heavy crop is harvested.

This may be satisfactory from the standpoint of the railroad, but it is hardly fair to the settler. There should be a uniform rate, year in and out, for the transportation of crops, and the only possible salvation for the settler of that country is combination, and the election of members to Parliament who will dominate, the railway and class interests.

This will eventually come about, but it is a pity that it should be accomplished through the struggles and hardships of sturdy citizens of "the States," who are induced to go there through misrepresentation.

Railroad Regulation vs "Baiting"

It is axiom that a pendulum, once started, will make several swings—its arc depending upon its momentum—before finding repose. In a consideration of railroad affairs—especially of the transcontinentals—it may be true that the pendulum at one time touched a point which for the sake of argument and to sustain the premise of the present day anti-railroad agitators, may be labeled "Pro-Railroad, or anti-Public." It is not to be assumed that this view of the question is altogether tenable, it would appear as though an unprejudiced study of the history of our railroads, in its larger aspects, would discover much justification for even those things, which today are the favorite field of exploitation of the "Man with the Muckrake." However, whatever one's private views may be, it will be found unprofitable to attempt an argument upon subjects which, like religion, are founded upon faith, or upon one's mental attitude toward the question.

Whatever the alleged crimes of the railways in the past, it is difficult to find, for the present hostile attitude of a large part of the public, any adequate motive. One cannot, if he views the subject in a dispassionate manner, and though the binoculars of intelligent understanding, rid themselves of the conviction that "Railway Regulation"—the favorite war cry of both political parties—has degenerated into "Railroad Baiting" of the most aggravated type.

This journal holds no brief for the railroads, its transportation bills are paid in cash—but the mission of the AGE is to further the development of the West and it would be puerile to attempt to deny to itself or to its readers that the West, as it exists today, the hope of "millions yet unborn"—would be an untamed wilderness but for the efforts of the railroads. It is beside the purpose to plead that what the railroads have done in this field was done in the hope of ultimate profit—the main-spring of all human endeavor, is and will be forever, for all we know, the desire to accumulate, in its last analysis the instinct of self-preservation. Granted that the policy of the railways has been dictated by selfishness it is an enlightened selfishness, which, infinitely superior to any debasing philanthropy, has opened avenues of comfort and content to millions and has made opportunities which, open to all comers, have made thousands rich, who, today, are clamoring for a government policy that, followed to its logical conclusion, can lead only to a paralysis of the railroads at a time when western communities are clamoring for better transportation facilities and cursing the very forces that brought them into existence, for not granting them rates that would mean the wiping out of hundreds of millions of investment values.

Is the attitude of the west fighting for seaboard rates which have been demonstrated to be unprofitable to the railroads and forced upon them by the exigencies of competitive business conditions a fair one?

James J. Hill, two years ago, with his prophet's vision, saw the handwriting upon the wall and declared that not less than five billion dollars would be required within the next decade to provide railroad facilities equal to the needs of that period.

Whence are these enormous capital requirements to come? Standard investment railroad stocks are "going begging" upon the New York exchange and the railways have been forced to find a market for their mortgage bond issues in Europe, paying from 5% or more for their loans. Does this reflect a healthy condition? The solution is clear enough—investors are loath to put their money into properties that are a standing target for legislative attack. Within the last year, the operating expense of the railways has increased enormously—the cost of materials has steadily mounted and labor, forced by the increased cost of living, has demanded and, in every case has secured without any demur upon the part of the railways, substantial increases in wages. The sum total of all these extra charges has been sufficient to wipe out the margin of increase in gross revenue and the railways, confronted with the need for fresh capital emissions upon which interest and dividend charges must be earned—fresh capital issued to supply the increased facilities for which the country is clamoring, have gone before the country with the entirely defensible proposition to increase freight rates sufficiently to care for these additional charges.

To the writer it looks like a very plain problem in commercial ethics—when a merchant forces an advance in costs he must add the extra outlay to his selling price or go out of business. The railroads cannot go out of business nor can they—unlike the merchant—curtail their expenditures—a certain standard of equipment and of service is demanded of them, by law. Their attitude in this matter rests upon the most elemental principle of justice and fair business tactics. It has been demonstrated, *ad infinitum*, that railway freight rates per ton mile, are lower in this country (and the service better) than in any other

first class civilized nation and that the advance asked would be so widely distributed that the "ultimate consumer" would not even be aware of it. It is a platitude to say that the railroads are the greatest industrial factors in the country and that the cessation of improvements and extensions with its accompanying release of hundreds of millions of dollars in active trade spells the difference between prosperous times and "hard times."

To call attention to the fact that billions represented by railroad capitalization are today distributed three times as widely as before the panic of 1907 may serve to show the extent of the hardship imposed upon the investing public when "standard rails" must decrease dividends.

The actions of the Illinois Manufacturers' Association in the East and of the various inter-mountain cities in the West, appear to us unjust, illogical and inconsistent.

The attention of our readers is directed to an excerpt from a recent issue of the "Commercial and Financial Chronicle" showing just how serious the situation is, from the standpoint of the railways.

State Advisory Committee.

Governor Edwin L. Norris of Montana has adopted a plan, at the suggestion of Secretary Arthur Hooker of the National Irrigation Congress, that will be highly beneficial to the Eighteenth sessions, and to the state as well, and one that Secretary Hooker believes might well be employed by other state executives.

Governor Norris has appointed a special committee of five members to be known as "the advisory committee of the state of Montana." This committee will co-operate with the officers of the National Irrigation Congress in making that great event a complete success, and will at the same time, be of material assistance to the state of Montana.

This special advisory committee of Montana consists of R. A. Carnochan, Butte; C. B. Whitter, Helena; W. W. Withee, Conrad; James Glass, Big Timber; W. A. Clark, Virginia City.

This committee, it is predicted, will promote the greatest activity in the state relative to the irrigation congress, attendance at it, participation in the irrigation exposition, and the utmost extraction of benefit from such participation.

Secretary Hooker, referring to Governor Norris' action, said: "This idea might very well be utilized by other states. It helps the congress and it helps the state. The mutual contact, the exchange of ideas, the strengthening of program, and the advertisement the state secures are the things to be considered. I hope other governors will follow the lead of Governor Norris."

The board of control of the Eighteenth National Irrigation Congress—the local body that is making the plans for the congress and for the state entertainment of the visitors—has applied this same idea to localities and sections throughout the state of Colorado, with great success. The five principal sections of Colorado are well organized, and in nearly every town of consequence, there is a special committee of the commercial body working actively in behalf of the congress and itself at the same time.

It is doubtful if the organization for any irrigation congress has been quite so thorough and systematic as in the case of the Eighteenth congress, Pueblo, September 26-30.

East Las Vegas, New Mexico, May 29th, 1910.

IRRIGATION AGE,
112 Dearborn Street,
Chicago, Ill.

Gentlemen:—

I do not know when my year's subscription to the Irrigation Age expires, but when it does I wish you would please renew it and send me bill for same. I consider your Magazine of the highest value to an Irrigation Lawyer for many reasons. It gives him a great deal of information in a practical way that is of great service in irrigation litigation, and in addition, enables him to keep abreast with current decisions affecting irrigation matters which might escape his attention except for your journal.

Very truly yours,
A. T. Rogers, Jr.

Box 188.

FOUNDATION

BY ALEX McPHERSON

The most of the failures in life can be traced to the foundation on which the superstructure was built. Great nations, states, communities, or great lives are not built on a foundation of ignorance and superstition. A successful, business, whether it be merchandising, mining, reclaiming arid land or farming must also be built on a foundation that is broad, deep and solid, else disaster will follow.

For the last generation there has been a mad rush from the country to the city until a large portion of the population of our large cities are not far removed from pauperism.

The foundation of a city, or its wealth, is not in the city, but in the country surrounding. Multitudes of people have overlooked this and have forsaken the foundation of our country's wealth and prosperity, seeking in the densely populated centers to build up from what? Their condition today tells the story. My brother, my sister, let us look life's problem squarely in the face. Are not the necessities of life constantly rising in price and is your earning power keeping pace, why is this? Some say the tariff, others say trusts, combines and what not. They can only be partially responsible for it. It is the man on the foundation of prosperity, the farmer who is boosting prices. No longer does he have to sell his products at harvest time, but holds them until the prices get high enough to suit him. There are so many non-producers, who must be fed, and so few, proportionately, who are producing the necessities of life "the law of supply and demand will prevail." What then shall we do? There can be but one answer, "back to the farm," back to the foundation where health and prosperity await you. By so doing you will not only benefit yourself but will benefit those who are left behind in the factory, the store, or the mine by relieving competition, which will help to allow the law of supply and demand to regulate the prices of labor.

The Farm Foundation.

In selecting the farm we should select wisely. All farms are not equal in productiveness, neither are markets or social and educational advantages equal in all localities. However, productiveness is the first consideration and this is found in the arid districts. The first poor essential factors in crop production are soil, sunlight, air, and water, in fact they are the foundation.

Soil.

Soil is the first consideration. All soils will produce crops, but some soils produce more bountifully than others. The most fertile and productive soils in the world are of volcanic origin. Soil is first pulverized rock, as there are different kinds of rock there must necessarily be different kinds of soil, but in countries where soil is of volcanic origin this does not exist or is not so marked. Let us illustrate: If we were to take all the different kinds of rock and melt them together in a great caldron they would all be mixed together, then pour the contents out let it cool, this, when pulverized into soil, would contain all the different kinds of soil in one; then instead of having limestone soil with limestone rock underneath the

soil the limestone would be thoroughly mixed with it, and instead of having granite and sandstone soil we would have a conglomerate soil thoroughly mixed, uniformly composed of all the mineral elements of the different kinds of soil in one, making it the richest and most enduring because it contains all the good qualities of all, then too, it is a virgin soil in the strictest sense of the word, as it has never been submitted to the leaching process, which has taken place in the humid countries.

Sunlight.

Sunlight is one of the most important factors in crop production, without it crops cannot grow. It necessarily follows then the more sunshine (other things being equal) the greater the growth. In the arid districts we have the greatest amount of sunshine possible, which brings wealth, health and happiness to all.

Air.

Man cannot live without air, neither can crops. Air and plenty of it is absolutely necessary to maintain life in both animated and inanimated objects. Air is necessary in the soil in order that plant food may be liberated for the plants. Air is necessary around the stem and leaves of plants in order that the plant may elaborate and assimilate its food. In fact from 92 to 97% of the solids in the crop is supplied from the air and sunshine. How important then are these factors in crop production as well as health and happiness in our people.

Water.

"Water is a poor master, but is a good servant when you have control over it." Water dissolves the plant food in the soil. Water is the medium through which all plant building material is distributed to the different parts of the plant and in addition to this water is by far the largest single constituent in all plant life.

Irrigation.

Farming in irrigated countries is not a haphazard business. The farmer is not subject to conditions over which he has no control. He becomes a manufacturer, a master who directs and controls crop production, water may be likened to the lever of an engine and the irrigator to the engineer having control of the forces he is dealing with. By supplying the right amount of water at the right time to his crop it may always be a maximum one.

Markets.

Markets for farm products and facilities for marketing is essential to success and must be taken into consideration, as a rule a railroad follows quickly in the wake of settlement of irrigated lands. In the arid section only a relatively small portion of the area will ever be brought under cultivation, the larger portion being devoted to stock raising and mining which provide splendid and never failing markets for farm products. The demand for hay by the stockmen has never been supplied and the mines and cities are compelled to ship in their supplies from distant states, as not enough produce is grown to supply the home demand. As an example of this we can take the state of Utah where only about 12% of the total area will ever be brought under irrigation. Utah produces annually from her mines \$32,131,000 of precious metal, over three million sheep are pastured on the grazing lands bringing to the state fifteen million dollars annually, horses, cattle and swine over \$10,000,000, poultry and eggs,

(Continued on page 399.)

EIGHTEENTH NATIONAL IRRIGATION CONGRESS

OFFICIAL CALL

To the People of the United States, Greeting:

The National Irrigation Congress will hold its eighteenth session in Pueblo, Colorado, U. S. A., Sept. 26-30, 1910.

The Congress Work.

The greatest economic, industrial development agency in our nation, the Congress has for its four subjects, "save the forests, store the floods, reclaim the deserts and make homes on the land."

We point with pride to the empire we are building in the "Great American Desert."

Our hearts are gladdened at the high type of citizenship which is developing, together with the more rational and scientific utilization of our resources.

Increased cost of living is not a bugbear when compared with the increased production fostered by the Irrigation Congress.

The great work so far accomplished is but the beginning. Irrigation, drainage, forestry, deep-waterways—all present big questions. Great minds agree as to their importance, even when differing as to their solution. They are being solved in the Congress forum where there are "Equal rights to all and special privileges to none."

You are needed to aid in the work.

Personnel.

The personnel of the National Irrigation Congress will be as follows:

The permanent officers of the Congress.

The President of the United States.

The Vice-President of the United States.

The members of the cabinet.

Members of the United States senate and house of representatives.

Governors of states, territories and insular possessions of the United States.

Members of federal, state, territorial and insular irrigation, water and conservation commissions.

State commissioners of agriculture and horticulture.

The mayor of each city or town having a population of over one thousand.

Officers, chairmen of committees, and permanent delegates of the congress.

Delegates.

Fifteen delegates appointed by the governor of each state or territory.

Ten delegates appointed by the mayor of each city of the United States of more than twenty-five thousand population.

Five delegates appointed by the mayor of each city in the United States of less than twenty-five thousand population and over one thousand.

Five delegates appointed by the chairman of each board of county commissioners or county supervisors in the United States.

Two delegates appointed by the mayor from each incorporated town having a population of less than one thousand.

Two delegates duly accredited by each regularly organized society devoted to irrigation, agriculture, horticulture and engineering.

Two delegates regularly accredited from each college and university.

Two delegates duly accredited by each chamber of commerce, board of trade or commercial club.

Visitors.

The presence of visitors is specially appreciated and their attendance is encouraged.

Early Appointments Desired.

Appointment of delegates should be made as early as possible to facilitate the organization of delegations, and notices of appointment with full name, occupation and

postoffice address of each delegate should be forwarded to the secretary of the National Irrigation Congress at Pueblo.

Foreign Representatives.

All foreign governments have been invited to send representatives to the congress.

The hearty responses from foreign governments at previous congresses have made the foreign representation an important feature of the organization. The increasing interest promises large representation this year.

Addresses.

The program will include addresses and papers by:

Experts in irrigation and forestry, including public officials and eminent citizens.

Foreign delegates.

Governors of states and territories.

Senators and representatives in the federal congress.

Statesmen and scientists.

Industrial and financial leaders.

Promoters of Carey Act reclamation projects.

Officials of private irrigation enterprises.

Discussion.

It is planned to make this a practical, live congress, and to secure the desired results from the consideration and discussion of the questions in which the delegates are interested, it is necessary that the delegates come prepared to discuss briefly and to the point the questions which come before the congress. Discussion is an important factor of the program, and will be encouraged.

Governors' Session.

The governor of each state and territory in the union, together with his staff, has been invited to be present on Governors' day, for which a session of the congress will be set apart.

Practical Irrigation.

Colorado presents all phases of practical irrigation practice. From the early ditch and simple headgate to the Gunnison Tunnel and underflow development is a long stride. All may be readily investigated in connection with the congress meeting.

Mountains and lakes, canons and brooks, hunting and fishing, camping and boating, desert and vineyard, all combine in making Colorado the travelers' paradise. Plan your outing so you can attend the congress and make your pleasure increase your profit.

National Irrigation Exposition.

In connection with the congress there will be an exposition featuring irrigation methods, machinery and products.

Railway Rates.

Delegates should notice particularly the opportunity this trip will give to visit numerous places of national interest. Full information can be secured from the railroads, or from the secretary of the National Irrigation Congress at Pueblo.

Information.

During the time of the congress an information bureau will be conveniently located for the benefit and accommodation of delegates and visitors, and every endeavor will be made to give them the best attention and accommodation.

Information relative to the Eighteenth National Irrigation Congress, program, rates, hotels and other data will be furnished upon request from the office of the secretary of the National Irrigation Congress, 339 Central Block, Pueblo, Colorado.

Pueblo, Colorado, June 15, 1910.

THE EIGHTEENTH NATIONAL IRRIGATION CONGRESS,

By B. A. FOWLER, *President.*

THE BOARD OF CONTROL, By ARTHUR HOOKER, *Secretary.*

By P. J. DUGAN, *Chairman.* R. INSINGER, *Chairman.*

R. H. FAXON, *Secretary.* BOARD OF GOVERNORS.

WARREN BILL.

A Bill Authorizing Contracts for Disposition of Waters of Projects Under the Reclamation Act, and for Other Purposes.

The following, known as the Warren bill, as now presented for action by the House of Representatives at Washington, is of vital interest to many sections of the West:

"That whenever in his judgment any part of the water supply of any reclamation project can be disposed of so, as to promote the rapid and desired development of such project, the Secretary of the Interior is hereby authorized, upon such terms, including rates and charges, as he may determine just and reasonable, to contract for the delivery of any such water to irrigation systems operating under the act of August 15, 1894, known as the Carey Act, and to corporations, associations, and irrigation districts organized for or engaged in furnishing and distributing water for irrigation. Delivery of water under any such contracts shall be for the purpose of distribution to individual water users by the party with whom the contract is made: Provided, however, That no such water shall be distributed otherwise than as prescribed by law as to lands held in private ownership within government reclamation projects.

In fixing rates and charges to be fixed in such contracts for delivery of water to any irrigation system, corporation, association, or district, as herein provided, said Secretary shall take into consideration the cost of construction and maintenance of the reclamation project from which such water is to be furnished. No irrigation system, district, association, or corporation so contracting shall make any charge for the storage, carriage, or delivery of such water in excess of the charge paid by it to the United States except to such extent as may be reasonably necessary to cover cost of carriage and delivery of such water through its works.

Sec. 2. That in carrying out the provisions of said reclamation act and acts amendatory thereof or supplementary thereto, the Secretary of the Interior is authorized, upon such terms as may be agreed upon, to co-operate with irrigation districts, associations, or corporations for the construction of

Section 8 of the Reclamation Act provides, in effect, that the use and distribution of water appropriated and impounded by the Secretary of the Interior shall conform with the state laws, and Congress could not otherwise provide for the reason, as stated by Justice Brewer in *Kansas vs. Colorado*, "We do not mean that its legislation can override state laws in respect to the general subject of reclamation." Under state laws a corporation or an association owning an irrigation project could be compelled, if it had water to spare, to deliver the same to anyone willing to pay for the same. It would appear, therefore, that Congress intended that the government should do, willingly, that which a private corporation could be compelled to do under state laws.

But in carrying out this intention, Congress failed to expressly provide that the secretary might contract with



Hotel Wolf, Saratoga, Wyo.

corporations or associations for the use and distribution of water which it might have under its control, and which was not necessary for the government's project.

The purpose of the second section is obvious to any-



A Street Scene in Saratoga, Wyoming.

such reservoirs, canals, or ditches as may be advantageously used by the Government and irrigation districts, associations, or corporations for impounding, delivering, and carrying water for irrigation purposes: Provided, That the title to and management of the works so constructed shall be subject to the provisions of section six of said act: Provided further, That water shall not be furnished from any such reservoir or delivered through any such canal or ditch to any one landowner in excess of an amount sufficient to irrigate one hundred and sixty acres.

Sec. 3. That the moneys received in pursuance of such contracts shall be covered into the reclamation fund, and be available for use under the terms of the reclamation act and the acts amendatory thereof or supplementary thereto."

In approving this measure, Secretary Ballinger reported as follows: "The object of the first section is to remove whatever doubt there may be in respect to the question whether the Secretary of the Interior under the Reclamation Act has authority to contract for the delivery of water from the government projects to corporations, companies, or irrigation districts in order that they, in turn, may deliver the same to tracts of land not in excess of 160 acres each, and not included within the government project.

one who has knowledge of conditions in the arid region. It is well known that there are not many available reservoir sites in comparison to the amount of water available for irrigation, and with the amount of land capable of irrigation. In some cases the government has secured available sites whereon reservoirs may be erected of such dimensions as will irrigate a much larger area of land than it is deemed wise to include within a government project. In the construction of a government reservoir the reclamation fund should be used only to construct it of such dimensions as will impound a quantity of water sufficient to supply the land within the project itself. Hence, unless the Secretary can co-operate and contract with companies, associations or districts to the end that reservoirs may be erected of such dimensions as to irrigate larger areas than the government has included within its own project, great areas of arid land, capable of irrigation will always remain barren.

Again, the government may have the only available location where it is practical to construct a gravity canal

(Continued on page 389.)

SARATOGA, WYOMING

Notes and Comment on One of Wyoming's Thriving Cities About Which There is a Peculiar Interest

Throughout the entire West there are few points that can boast of more wondrous scenery, interlaced with the wierd and superstitious Indian legend and tradition, than can the district surrounding Saratoga, Wyo., and the north end of the Medicine Bow range of mountains. Nor is it strange, even to visitors of the white race, that this section inspired the red men with awe. Elk mountain, known to the Indians as "Mystery" mountain, and the hot springs bubbling from the ground at Saratoga, coupled with the marvelous scenery of the entire district, were sufficient to awaken the religious sentiment of the savage and convince his spirit that the Gods were in both earth and air.

The North Platte River, which has its rise in Colorado, some place in the vicinity of Steamboat Springs, flows through as beautiful a country as, perhaps, any stream in the world.

Taking a slightly northwesterly course over the line between Wyoming and Colorado, it flows on in that direction for many miles, through Wyoming, then makes a broad sweep up around Casper, then down through other delightful scenery to Alliance, from whence it turns in a southerly direction to its junction with the South Platte, at the town of North Platte, on the Union Pacific Railway.

Along the greater part of this distance may be found rugged mountain scenery, great sweeps of land suitable for

learned that remarkable cures, indeed, were performed by these waters.

A number of mountain streams empty into the North Platte near the site of the town of Saratoga. These streams were famed as giving the best trout fishing in the west. Indeed, fishing at that time, was as much of a necessity as a pastime, and before restrictive laws were put in force, was highly profitable to those engaging in it. These streams still abound in trout, both "rainbow" and the "speckled beauty," and the writer, who has tried many of the streams throughout the west, found the North Platte river, near Saratoga, to be one of the best and cleanest streams for fly or bait casting he has ever visited.

During the early days of Saratoga, great bath houses were erected, and were used by invalids, who came from various points of the country to test the waters. Finally families located in the town because of the natural attractiveness and healthfulness of the place. The beginning of mining for copper in the mountains surrounding the town did much to help Saratoga in its early days.

The hotels and homes of Saratoga were filled, in those days, with investors, prospectors, mining operators, stockmen and sportsmen, as well as invalids seeking health.

Those who have visited Wyoming, and traversed its length from east to west, have, no doubt, had their attention attracted to the famous Elk mountain, which may be seen for a distance of sixty miles, as one travels in either direction along the Union Pacific Railway. This is a mountain of marvelous beauty, backed by fine sky effects, and its nearness to the town of Saratoga adds to its picturesqueness. In the early days "Elk Mountain" was known to the Indians as a mountain of mystery. It is the last high point on the northerly end of the Medicine Bow range, and stands out



A Typical Ranch in the Saratoga Valley, Wyoming.

agriculture and grazing, banked on either side by mountains, in which valuable minerals are to be found.

While in search of health, recently, the editor of this journal, who has traversed the low reaches of this wonderful stream, from North Platte to its southerly sweep, near Casper, decided to view it from its southern Wyoming reaches, and a visit was made to Saratoga, a city about thirty miles south of the main line of the Union Pacific Railroad, in Carbon county. In the early days, this twenty-five or thirty miles was traversed by stage, but recently a line of railroad, known as the Saratoga-Encampment line, was constructed, offering a much easier and quicker means of travel to Saratoga, and to the upper reaches of the stream.

About twenty-five or thirty years ago the town of Saratoga was started in one of the most delightful spots along this entire stream.

Numerous springs of hot water bubble from the ground at this point and these were formerly used by the Indians, and known as "Big Medicine Waters," long before the white men invaded this section. It was the favorite camping place for many of the tribes, both from the mountains and the plains, and stories of wonderful cures were brought to the settlements by the Indians, who annually visited this section. After the whites had reached the country it was

distinctly from Saratoga, which is within a little over half a day's drive from its base. Legend tells us that the Indians considered Elk Mountain "Bad Medicine," or a haunted mountain, and it is said, by some of the old settlers, that they were not inclined to live upon, or too close to the base of the mountain. Of this, we have no verification, but narrations now being prepared by Mr. Crawford, editor of the *Saratoga Sun*, for the use of *THE AGE*, will throw additional light upon this interesting subject.

In connection herewith is shown numerous views in and near Saratoga, including this famous mountain. It is a peculiar fact that mountains, such as this, do not show strong in photographs, when they are taken on the mesas near the foot-hills. In fact, the writer has never seen a good photograph of Elk Mountain. Of a necessity the extreme beauty of the view cannot be fully portrayed in the pictures herewith presented.

It is our intention to prepare, through the assistance of some of the citizens of the North Platte Valley, a series of articles covering all of the principal features of that section. We will attempt, also, to describe from time to time, stock and agricultural ranches, which have been or are at present being developed along the North Platte River.

(Continued on page 371.)

Irrigation of Alfalfa

By SAMUEL FORTIER,
Chief of Irrigation Investigations, Office of Experiment Stations,
U. S. Department of Agriculture.

FARM DITCHES.

The capacity and, to some extent, the location of farm ditches depend chiefly on the method of applying

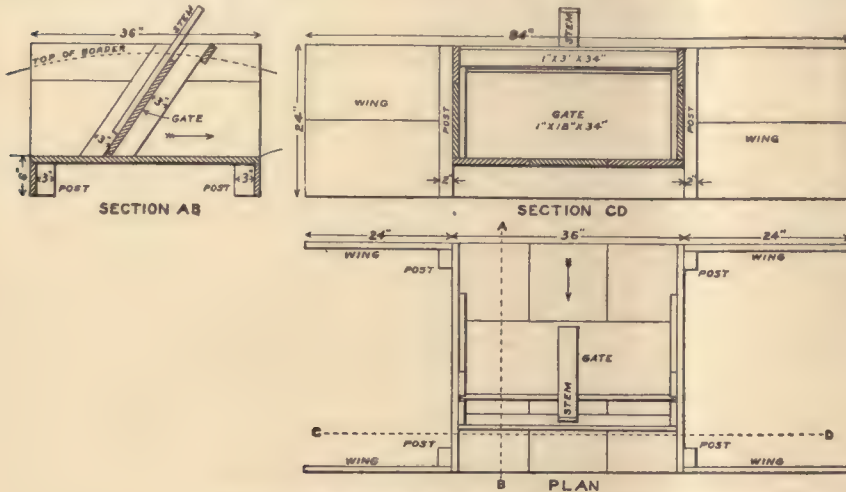


Fig. 22—A Border Gate Used in Imperial Valley.

water. In the border method the supply ditch is usually large and so located as to convey a sufficient volume of water to the head of each land. In Imperial Valley in

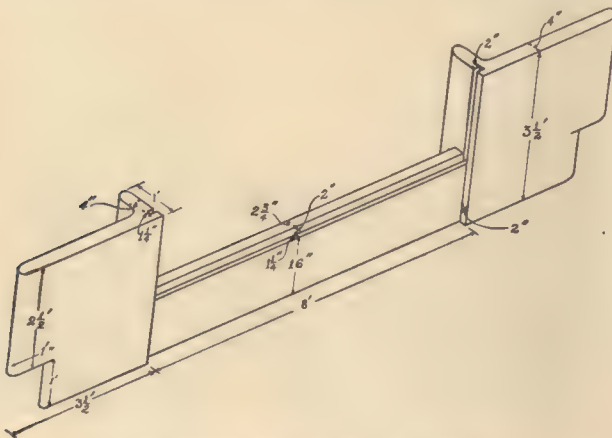


Fig. 24—Concrete Gate Used in Yolo County, Cal.

California these head ditches, as they are called, have a bottom width of 6 feet and a surface width of 12 to 14 feet. In building a ditch of this size a strip 6 feet wide on the center line of the ditch is plowed 6 inches deep. Then parallel strips, also 6 feet wide, are plowed 8 feet distant from it. Scraper teams then cross and recross these, taking dirt from the plowed strips and dumping it on the unplowed spaces to form the banks. The banks when completed are about 2 feet above the natural surface of the ground, and the bottom of the ditch is 6 to 10 inches below it. When it is deemed best not to create a depression at the outer toe of each embankment, the borrowed dirt is taken from the high parts of the adjacent land.

The water required for each land is withdrawn from the head ditch through a border gate. These are usually made of wood. Figure 22 shows the type of border gate used by F. N. Chaplin, of Holtville, in Imperial Valley. It requires 49 feet b. m. of redwood, which, at \$42 per thousand, makes the lumber cost \$2.06. The hardware, carpentry and setting increase the cost to about \$3.25. If it is assumed that 22 gates are needed for a 40-acre tract the cost per acre for the border gates is \$1.79. A cheaper border gate is shown in figure 23, which represents the kind used on an alfalfa tract at Sunset City, Cal. In some localities concrete is being substituted for wood, and figure 24 shows a border gate of this material, quite generally used for the irrigation of alfalfa in Yolo county, Cal.

In the check method of irrigation the volumes used do not differ materially from those required to flood the lands in the border method, and the feed ditch for the checks corresponds in size and capacity to that of the head ditch for borders. Cross sections of common forms of supply ditches are shown in figures 25 and 26. The carrying capacities of these ditches under different grades are given in the accompanying table.

In flooding land from field laterals two kinds of channels are needed. The larger ones convey the water to the highest corners of the fields and along one or two borders of each field; the smaller distribute the water over the field. In this method of applying

water smaller streams are used than in either the check or the border method. Except on large farms the stream seldom exceeds 3 cubic feet per second, and is usually between 2 and 3 cubic feet. On ordinary grades only a small channel is needed for this volume. Such channels are made by plowing first a strip as wide as the surface of the ditch is to be when full and removing the loose dirt by one of several designs of A crowders, two of which are shown in figures 27 and 28. One of the best implements for making field laterals is a 14 or 16-inch lister plow on a sulky frame. Figures 29 and 30 show cross sections of lateral ditches made in this way, while figure 31 represents a common type of supply ditch. The effect which grade has upon such channels is shown in the accompanying table, giving discharges of these ditches, with various grades.

Subirrigation of Alfalfa Fields.

As a general thing, alfalfa is irrigated from the surface downward by one of the methods previously described. There is, however, a small percentage of alfalfa lands, probably not more than 5 per cent of the total, which is irrigated from below. Frequently the seepage water from porous, earthen ditches and the waste water from irrigated areas pass through the subsoil of lower fields sufficiently near the surface to subirrigate them. In other places these seepage waters collect at the lower levels and raise the ground water near enough the surface to supply the plants with the needed moisture. It is questionable if alfalfa growers should place much dependence on this mode of supplying moisture to the plant.

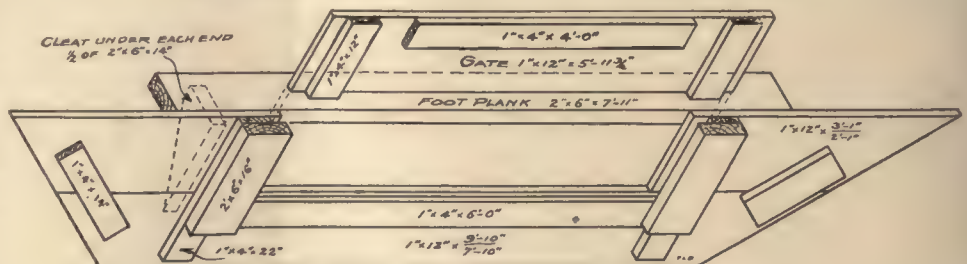


Fig. 23—Border Gate Used Near Sunset City, Cal.

What is gained in not having to irrigate is usually more than lost in damage done to both soil and crop by the rise

of the ground water. Wherever alkali is prevalent the rise of the ground water near the surface is almost certain to be followed by an accumulation of alkali on the surface. Again, the fact that alfalfa fields subirrigate is usually nature's way of giving warning that the ground water is rising dangerously near the surface, and observations should be made to determine if the level is above the danger limit. One of the best ways of making such determinations is by means of bored test wells. These are made by boring holes from 2 to 4 inches in diameter in different parts of the field and noting at regular intervals the elevation of the ground water in each. Where the subsoil is a clay or a clay loam no lining will be necessary other than a joint of drain tile or a short wooden tube. Where the subsoil is loose it may be necessary to line the wells with thin galvanized iron or with a wooden box. The wells

and two crops of hay are raised.

Throughout the arid region there are a few localities where subirrigation is quite generally practiced. Perhaps

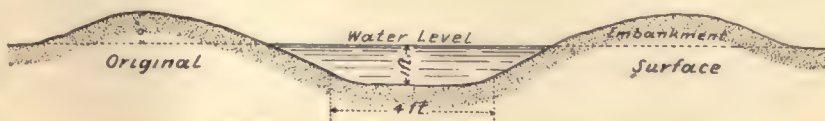


Fig. 25—Supply Ditch with Bottom Width of Four Feet.



Fig. 26—Supply Ditch with Bottom Width of Six Feet.

may be connected by a line of levels, the elevations being taken on the tops of stakes driven beside the wells. These well records, if taken at weekly or even monthly intervals, for several years, will show at a glance not only the

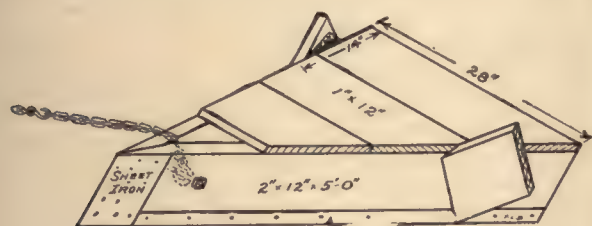


Fig. 27—"A" Crowder.

position of the ground water, but also its rise and fall throughout the seasons. Whenever it is found that the water table stands for any considerable time at less than 4 feet from the surface there is cause for alarm, and measures should be taken to prevent such an accumulation of seepage waters or to remove the surplus by drainage.

Alfalfa is subirrigated also from the beds of streams. On bottoms the danger is not so great, because there is less alkali present and the height of the ground water is governed by the condition of the stream. It happens often that when the water table is at its highest point the alfalfa plants are dormant, or nearly so, and as a result are not so readily injured. Two cases of successful subirrigation from stream channels are here cited by way of illustration.

On the farm of J. A. King, located on the second bottoms about 5 miles northeast of Boulder, Colo., the water table is 10 to 12 feet below the surface. An average yield of alfalfa of 4 tons per acre has been obtained for the past nine consecutive seasons from this farm without any perceptible deterioration. The crop was irrigated the first year, but after that the roots had evidently reached water and continued to draw their supply from that source.

On the Arkansas river south of Cimarron, Kans., John Bull has an alfalfa field of over 50 acres which is subirrigated. The water table is found at a depth of 6 to 8 feet, and the yield is usually 1 ton at each cutting. It is cut three to five times each season, and in some years one crop of seed

the most notable of these is to be found in the vicinity of the towns of St. Anthony and Sugar City, in the upper Snake River Valley in Idaho. This subirrigation district comprises an area of about 60,000 acres. A characteristic of the subsoil of this large area is that it is composed of sand and gravel, sometimes mixed with cobble rock to the lava bed rock, which is found at depths varying from a few feet to 90 feet. The surface soil around St. Anthony is a dark-colored gravelly loam 2 to 4 feet deep. On the Elgin Bench it is a dark sandy loam 1.5 to 5 feet deep, while around Sugar City it is a clay loam 4 to 6 feet deep. The land slopes to the south and west at the rate of about 10 feet to the mile.

At first ordinary ditches were built and for years attempts were made to irrigate the land by the usual methods. These failed, however, since all the



Fig. 29—Lateral Ditch with Bottom Width of Fourteen Inches.

water turned into the ditches soon sank into the porous subsoil beneath. In time much of this subsoil filled up



Fig. 30—Lateral Ditch with Bottom Width of Sixteen Inches.

with water, due to an impervious lava bed rock, and the top layers of soil became moistened from below. This

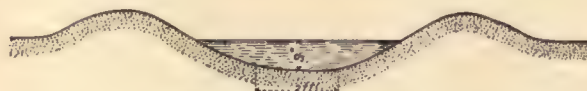


Fig. 31—Lateral Ditch with Bottom Width of Two Feet.

condition led the farmers to adopt a new method of irrigation, a type of which is shown in figure 32. On a

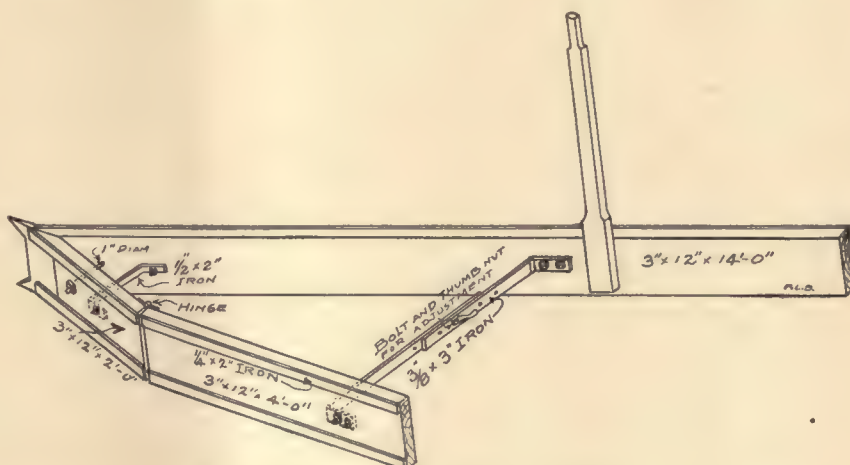


Fig. 28—Adjustable "A" Scraper or Crowder.

farm of 120 acres, the property of C. H. DeCamp, located 12 miles south of St. Anthony, Idaho, the main canal passes along the north and west boundaries. From this a supply ditch is run which feeds the smaller laterals.

These laterals are shallow ditches about 3 feet wide and 6 inches deep and divide the farm into strips. On the majority of farms the laterals do not exceed 1,320 feet in length and are spaced 100 to 300 feet apart. On this particular farm their length is increased beyond the average

near the surface to supply the needed moisture to the roots of plants. Thereafter the height of the ground water is regulated by the amount of water turned out of the supply ditch. The rise and fall of the ground water is determined by means of small boxes set in the ground 3

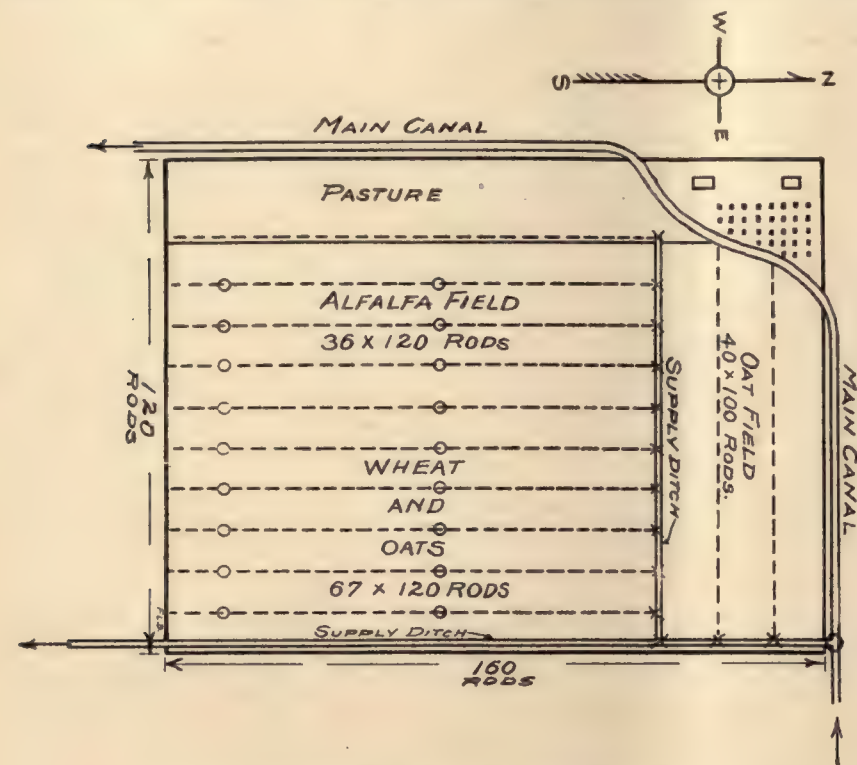


Fig. 32—One Hundred and Twenty-Acre Subirrigated Farm of C. H.

and their width decreased. In this mode of irrigation no water is spread over the surface; the laterals merely distribute 15 to 20 miner's inches each to different parts of

Table giving the mean velocity and discharge of ditches with different grades:

LATERAL DITCH, FIGURE 29.

Grade			Discharge		
Inches per rod.	Feet per 100 feet.	Feet per mile	Mean velocity in feet per second	Cubic feet per second	Miner's inches under 6-inch pressure head.
1/8	0.25	13.33	1.01	0.67	27
1/4	.38	20.00	1.23	.81	32
1/2	.51	26.67	1.42	.93	37
3/4	.63	33.33	1.59	1.05	42
1	.76	40.00	1.75	1.16	46
1 1/4	1.01	53.33	2.04	1.35	54
1 1/2	1.26	66.67	2.28	1.50	60
1 3/4	1.51	80.00	2.50	1.64	61
2	1.77	93.33	2.70	1.78	71

LATERAL DITCH, FIGURE 30.

1/8	0.13	6.67	0.82	0.80	30
1/4	.25	13.33	1.16	1.00	42
1/2	.38	20.00	1.42	1.30	52
3/4	.51	26.67	1.64	1.50	60
1	.63	33.33	1.84	1.70	67
1 1/4	.76	40.00	2.02	1.80	74
1 1/2	.88	46.67	2.18	2.00	80
1 3/4	1.01	53.33	2.34	2.10	86
2	1.26	66.67	2.61	2.40	96

LATERAL DITCH, FIGURE 31.

1/8	0.06	3.33	0.79	2.08	83
1/4	.13	6.67	1.13	3.00	119
1/2	.25	13.33	1.60	4.20	163
3/4	.38	20.00	1.97	5.20	207
1	.51	26.67	2.28	6.00	239
1 1/4	.63	33.33	2.57	6.80	270

the field, where it soon joins the ground water by sinking through the bottoms of the shallow ditches. The land is planted in the early spring when the ground water is low, and then water is turned into the ditches and kept in day and night until the ground water rises sufficiently

to 5 feet deep, as indicated by the circles in figure 32. Twenty to 30 boxes are usually required for each 80-acre farm. All water is turned out of the main canal prior to September 15 to permit the land to dry out for the harvesting of such crops as sugar beets, potatoes, etc. When the crops are removed, a small stream is left running in the main canal all winter; but notwithstanding this supply, the ground water usually falls from 6 to 20 feet below the surface during the fall and winter months. This somewhat novel method of applying water has led to the adoption of a rotation of crops which seems to suit both water and soil conditions. Alfalfa does not do well after the third year. This is chiefly due to the height at which the ground water is kept during the spring and summer months. Then, too, the soil is lacking in humus. These conditions have led the farmers to grow alfalfa on a tract for two or three years and then to turn the alfalfa under and raise grain, sugar beets and potatoes for the next three years. Under this rotation the yields per acre on well-managed farms are 40 to 60 bushels of wheat, 75 to 110 bushels of oats, 50 to 90 bushels of barley, 300 to 500 bushels of potatoes, 15 to 20 tons of beets, and 4 to 6 tons of alfalfa. The land sells for \$100 to \$150 an acre.

NOTES ON THE EIGHTEENTH IRRIGATION CONGRESS.

By R. H. Faxon.

Interest in the irrigation exposition, to be held in connection with the Eighteenth National Irrigation Congress, is growing constantly. All the sections of Colorado are making organized effort to be represented at the exposition and the interest outside the state is also very large. There are calls for reservations of space and daily inquiries in the offices of the board of control, Pueblo, Colo.

The interest among manufacturers of irrigation devices, pumps, machinery, etc., is increasing rapidly and there is every prospect that the exposition will be a success in that respect.

Information may be had concerning this exposition by writing the secretary of the board of control at Pueblo.

DEL NORTE, COLORADO.

Del Norte is located in the San Luis Valley, Colo.—in that vast irrigated plateau where the sun shines nearly every day in the year. Once but a mining supply point, the irrigated district has increased so greatly that the business of the town is now almost wholly devoted to supplying the wants of the irrigationist.

Water is taken from the Rio Grande by direct flow and has been applied to the soil for a number of years, resulting in enormous crops—crops that have taken prizes at the state fairs and at even larger exhibits.

There are about 600,000 acres of government land left in the San Luis, some of which is within four miles of Del Norte. Within a few years all of it will be under irrigation. The town is growing rapidly, had an exhibit at the Chicago land show, and offers excellent opportunities.

Send \$2.50 for The Irrigation Age, one year, and cloth-bound copy of the Primer of Irrigation.

ARID AGRICULTURE

BY

B. C. BUFFUM, M. S.

Manager of the Wyoming Plant and Seed Breeding Company, Worland. Former Professor of Agriculture in the University of Wyoming and the Colorado Agricultural College, and Director of the Wyoming Agricultural Experiment Station.

THE CONSERVATION OF MOISTURE.



PROF. B. C. BUFFUM.

There has been much speculation in regard to the possible production of a crop with a certain amount of moisture. This interest has arisen from experiments carried out in France and parts of this country, which show the amount of water taken up by plants and transpired from their leaves to produce their growth. In one of these experiments, it was shown that it took an average of three hundred pounds of water taken from the soil to produce one pound of dry matter. On this basis, Headden made a calculation of the approximate amount of water required for the production of a

twenty-five-ton crop of sugar beets. Where sugar beets produce a large amount of tops, these tops have been known to equal at least ninety per cent of the weight of the roots. To grow twenty-five tons of beets, then, there would be twenty-two and one-half tons of tops. In the beets there would be five tons of dry matter requiring fifteen hundred tons of water, and the tops and beets together would require 2,175 tons. This amount of water would cover the land to a depth of over nineteen inches, and on this basis, twelve and one-half tons per acre could be produced with ten inches of moisture, provided it is all saved and made available to the plants.

Several years ago, the author made the following statement: The amount of water found to be necessary to produce one pound of dry crop of grains in the humid region is approximately five hundred pounds, which is used by the plant and evaporated from the soil during growth. An annual rainfall of twelve inches would bring to each acre of land 2,722,500 pounds of water. If all this water could be made available for the crop during the growing season, and assuming that 500 pounds of water is sufficient to produce one pound of dry crop, twelve inches of rain would produce 5,445 pounds, or approximately $2\frac{3}{4}$ tons of vegetable matter. If one-half the rainfall of a single year could be saved to the growing plant, it would support more crop than the average native hay production of our irrigated meadows.

Such speculations are useful as indicating certain possibilities, but it is unquestionably true that some plants require more moisture than others, and there are many things to consider outside of the actual amount of moisture used. There are drouth-resistant crops which will approximately stand still in time of drouth until more moisture renews their growth. Other drouth-resistant crops have so adapted themselves to arid conditions that they produce less top and leaf surface to evaporate the water and put their energies chiefly into the production of seed or fruit rather than into the making of much growth. We find nothing in these scientific speculations which is discouraging to the dry farmer or which would indicate that it is impossible to produce profitable crops of suitable plants once in two years where the annual rainfall is as little as eight or ten inches. "The proof of the pudding is in the eating," and such crops having actually been produced under such conditions, is sufficient demonstration of the fact.

Having the principal rainfall come during the growing season is a great advantage in some ways. Often a crop will have used up the stored soil moisture and be ready to give up the struggle when a rain will revive the plants and make them mature successfully. This enables the farmer to take advantage of that useful semi-dormant or waiting character of certain drouth-resistant plants.

Soil Mulch.

Maintaining the soil mulch is one of the most important factors in the success of dry farming. It is by the soil mulch that we are able to make our soils absorb all the moisture that comes to them by precipitation or from dews or other moisture. By it we conserve this moisture and prevent its loss back into the air by evaporation. Summer-tilled land should at all times be covered with this mulch, which should be in granular form of small lumps. Care should be taken not to get it too fine. Dust does not absorb moisture so well and is apt to drift or blow away. Working the ground when dry will tend to make the surface soil too fine. The object of cultivating the summer fallowed soil is to prevent the formation of a crust after heavy rains; to allow proper action of sun and air; to prevent the moisture from rising to the surface where it will evaporate and to destroy the growth of weeds. The film moisture in the soil travels up and down by what is called capillary action. This is merely the flowing of the moisture which surrounds one particle of the soil to, and around, the next soil particle, which is close enough to touch the film and so on as long as the



Some Arid Land Recently Opened for Settlement—Shoshone Reservation.

soil particles are close enough together, until it reaches the surface where it is evaporated. By stirring the soil, we let in air and separate the grains of soil so the capillary movement is stopped, and loss by evaporation is prevented. The soil mulch must be maintained over the whole field, and the drag harrow is the principal tool used for this purpose. Writers have recommended that those who practiced summer-fallowing should get on to the land with the harrow immediately after every rain or snow. This is not always necessary or advisable, for working too soon may cause rapid loss of the moisture which is still in the surface layer. The ground should be worked as soon after every heavy rain or snow as it is dry enough. Do not wait too long, for when too dry the soil will dust and drift. Light rains may cause actual loss of soil moisture by forming a connection which lifts the water to the surface, where it is lost into the air. Judgment should be used and the ground cultivated as early and often as the conditions indicate.

Humus and Vegetable Mold.

There is much misconception about what humus is. Often when we speak of humus, we do not mean true humus, but refer to the partially decayed plant substances, which were better called vegetable mold. True humus is the final product of the decay of organic matter in the soil. It is a very complex chemical compound, which contains nitrogen, and may act in an important way toward the change and use of soil plant foods. On the other hand, it is the partially decayed vegetable matter which has so much to do with tilth. This substance absorbs water, holds the soil particles apart, aerates the soil, and fosters bacterial and chemical changes which should pay for a do-nothing proposition, with reference to legislation. Since the Reclamation Act was passed eight years ago it has not been remedied in any respect whatever, and it has been defective from the hour it was passed. The time has come to get relief along as many lines as possible."

are of most value to living plants. This decaying condition must be kept up by continual renewal of organic matter.

Packing the Soil.

There are three or more conditions of soil which call for the use of some form of packer. Soils that are covered with so much grass that they do not naturally fall close enough to shut out large air spaces at bottom of the furrows may be packed to advantage. Loose loam soils that overlie a sub-soil which contains considerable moisture may be packed to bring the particles close enough together to lift the moisture from below by increased capillary action. The surface soil may sometimes be packed to either warm it or get rid of surplus moisture. Where good results follow packing, it should not be neglected for it may mean success. Many western soils, especially those containing much granite, sand or gypsum and lime naturally become compacted very soon after plowing. Such soils may be so hard that the attempt to keep them properly loosened up is more important than trying to make them more compact.

Use of the Roller.

Rolling soil warms it. There are cold, damp soils which may be rolled at times with advantage. It is usually better to use a corrugated roller in the West, because it leaves the surface rough and there is less drying out or drifting by winds. The smooth roller on young grain will sometimes bring up the moisture and cause the

corrugated roller, unless it is desirable to lose moisture instead of save it, or warming the soil for a time is the end sought. Where the packer is used, the soil should be harrowed immediately afterward to establish the earth mulch.

Harrowing.

Next to plowing, the principal operation on the dry farm is persistent and continuous use of the harrow. The ground should always be harrowed the same day it is plowed, and if it is new sod-ground, at least, the harrow should be run the same direction as the plow. This harrowing should be kept up often enough to maintain a proper surface mulch for the prevention of the loss of moisture by evaporation. Small grains should be harrowed in the spring and no damage will be done if the harrow is run crosswise of the drills, the harrow teeth kept sharpened and the horses made to walk fast. The main tools to use for shallow surface cultivation is the drag, or spiked-tooth harrow, and the weeder. Every farmer should have one with levers by which he can regulate the slant of the teeth. It does not pay to use a two-horse harrow on large fields. Four-horse tools of all kinds are far more economical. With a three-section harrow and four horses, a man or boy can cover thirty to thirty-five acres per day, which makes the maintenance of summer tillage possible on a considerable area of farm land.

The Disc Harrow

The disc is an indispensable farm implement in the West. Discs of fourteen inches diameter do much better and more effective work than do those of larger size. The draft is not so light as is that of sixteen or eighteen-inch discs, but the object of farm operations is to do the work, and good work cannot be done with a large disc. The disc should be used to break up the surface sod or stubble immediately after harvesting, and where this is done, it will be found that plowing will produce a much better seed bed. Turning under the disced surface also leaves less air space and the soil reservoir is more perfect. The disc is useful to destroy weeds on summer tillage, but it must be used when the weeds are small. It will merely cultivate large weeds. Always lap the disc one-half, which double-discs the ground and leaves it level. The disc is very useful for certain forms of cultivation, especially with alfalfa. The new alfalfa harrow consisting of a series of spikes arranged in disc form seems to be one of the best tools for the cultivation of alfalfa.

Other Harrows.

Perhaps the Acme harrow is one of the most useful soil pulverizers for the farm. It does most excellent work where shallow surface cultivation is required. The spring-tooth harrow is a useful implement for harrowing compact and tough soils. There are some new harrows now being constructed on the general plan of the old drag or toothed harrow, but with modified teeth. One is a small disc three or four inches in diameter, riveted horizontally to the lower end of the harrow tooth. Another has the lower end of the harrow tooth bent at right angles and flattened and sharpened in the form of a knife blade. These harrows serve the double purpose of loosening the soil and cutting off weeds.

The Weeder.

The weeder is a modified harrow with long curved spring teeth. It is a most valuable implement on dry farms for the easy and rapid cultivation of grains and other crops. It can be used after the plants are too high for ordinary harrowing. For large work, using four-horse gang weeders is most economical in time and labor.

Good Harrowing.

Good harrowing for the purpose of conserving moisture is that which more thoroughly breaks up the surface soil, without making dust of it, kills the weeds, saves the moisture, and cultivates the crop. If the soil is hard or wet and in such condition that the disc or harrow teeth leave open scratches and cracks instead of mixing and turning the soil, the loss of water will be greater than it would be without harrowing at all.

Send \$2.50 for the Irrigation Age 1 year, and a cloth bound copy of the Primer of Irrigation.



Wyoming State Dry Farm Demonstration, East of Cheyenne.—Winter Rye, 44 Bushels per Acre; Winter Wheat, 35 Bushels per Acre.

soil to absorb enough warmth to prevent injury by cold. The roller is not an essential farm implement on western farms.

Subsurface Packer.

The subsurface packer, recommended for arid soils, consists of a series of wedge-shaped wheels, about eighteen inches in diameter, and set six inches apart. The object is to pack the lower half of the plowed area and leave the surface loose. This implement is of value on many soils. Its use has not always given valuable results on our more arid soils. There is little advantage to be gained by the use of the subsurface packer over much of the arid region unless it is on spring plowing of sandy soils, because the soil and subsoil is not such that the compacted area either attracts or saves additional moisture, and the ground becomes sufficiently dense for the roots of crops without the additional work. Packing is often of great value. Many have observed instances of winter grain in the packed area left by wagon or drill wheels passing over it, living where adjoining grain was killed out. Generally spring grains produce better growth and crops where some wheel has pressed the soil together.

We believe that packing is always advisable around the newly planted seed and recommend almost with no exception the use of some form of press drill. The subsurface packer is better than either the smooth roller, or

THE CAREY ACT

HOW TO ACQUIRE TITLE TO PUBLIC LANDS
UNDER THE ACT.

A Comprehensive Survey of the Regulations in Force
in the Various States.

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VII.

TAXATION.

IDAHO.—Approximate valuation of cultivated lands with permanent and paid-up water-rights, from \$50.00 to \$125.00 per acre. Land valuations, including water-rights, are taxed together. "Carey Act" lands are listed for taxation upon final proof being made. Improvements are listed separately from land valuation and before final proof.

WYOMING.—No tax, or assessment, can be placed upon "Carey Act" lands until patent has issued from the federal government to the state and from the state to the settler. Houses, and other improvements, upon "Carey Act" claims are subject to taxation. When finally taxed, the lands are usually assessed during the first year at \$5.00 per acre, but this amount is increased as the payments made by the settler increase his actual interest in the land.

COLORADO.—Valuations of "Carey Act" lands include the water-rights and range, with such permanent water-rights, according to degree of cultivation and other factors, from \$12.00 to \$175.00 per acre. "Carey Act" lands (under present rules) are not taxable until the state has received United States patent. Improvements are always listed separately from land, at any time, regardless of final proof or patent upon the land.

UTAH.—Valuations include water-rights, as in other states, although the valuation would not be fixed upon the basis of "paid-up right," until full payment has been made for such "right." Lands are assessed for taxation as soon as final proof has been offered. Improvements are listed, and valued, separately, for purposes of taxation, and are assessed without reference to the ownership of the land upon which the improvements are situated. In other words, the settler's buildings, etc., are listed for taxation even before he has acquired patent to the land assessed. Valuation on all classes of property is assumed to be about 50 per cent of real value (at time of writing); the usual rate is 2 per cent outside of incorporated towns and cities, varying, as in other states, as between different counties, cities and school districts. The elected officers fix the rate annually.

MONTANA.—Valuation of "Carey Act" lands include water-rights. Lands are not taxable until patent is issued to settler. Improvements are listed separately from the land, and are taxed as soon as made. The approximate valuation of cultivated land is \$5.00 to \$10.00 per acre; the valuation of uncultivated land from 50 cents to \$5.00 per acre.

NEW MEXICO.—Valuation of irrigated lands (which valuation, in every case, includes water-rights) ranges from \$50.00 to \$500.00 per acre. Lands are not listed for taxation until patent has issued to settler, nor are permanent improvements, such as buildings, fences and other permanent fixtures, listed until patent has issued. Personal property, such as implements, stock, etc., is taxable at any time.

Provisions for Schools.

IDAHO.—School Districts.—Boundaries indefinite and with varying number of families. Districts are created by county commissioners. Minimum number of children in district, 10. Legal school age, from 6 to 21 years. Funds available for school purposes, as in other "Public Land States," all funds or interest upon funds, derived from sale or lease of so-called "School Lands" (Sections 16 and 36 in each township (36 square miles) are restricted to school purposes. In addition to this fund there is a

levy (in 1910) of 5 mills for school purposes. Special levies must be submitted to a vote of property owners in the district.

WYOMING.—Boundaries of school districts are fixed by county superintendents of schools. Minimum number of children to district, five. Legal age, from 6 to 18 years. Funds, and interest upon funds, derived from sale or lease of "School Lands" restricted to school purposes. Special taxation is subject to control of residents of districts. Wherever it is shown that there are five children of legal age, without school facilities, a district school may be established by the county superintendent.

COLORADO.—School districts must contain not less than nine square miles and not less than ten children of legal age (from six to twenty-one years). All revenues from "School Lands" restricted to school purposes. Special levies (at date of this writing) are limited to 15 mills for 3d class schools, and 20 mills for 1st class and 2d class schools.

UTAH.—Boundaries of school districts are fixed by county commissioners, subject to statutory provisions. Legal age, from six to eighteen years. The parents of fifteen children of legal age may demand a school, and the parents of twenty children within a district already established, if living two miles, or more, distant from the established school, may demand a separate school. Towns of 2,000, or more, inhabitants must maintain kindergarten schools for children between the ages of 3 and 6. The statutes provide for compulsory attendance of pupils from 6 to 14 years of age during at least twenty consecutive weeks out of the forty weeks of the school year. Utah has a grant of four sections in each township, as "School Lands," the revenue from which is restricted to school purposes, in addition to which there is (now) a school tax of 3 mills, which is computed upon all property assessed in the state. Each county, also, has a school tax levied by the commissioners, which, together with the funds derived from the state, is distributed upon the basis of school population. Each school district, in addition, levies a tax for school purposes, through its board of trustees, and the board of education may levy a tax on all property of the district for its own uses. The taxpayers, who are qualified electors, may vote special taxes if necessary.

MONTANA.—School districts are organized upon petition, to the county superintendent of schools, upon the part of parents of not less than ten children between the ages of 6 and 21, provided the parents live at a greater distance than two miles from a school house. All funds and the interest upon funds, derived from the sale or lease of sections 16 and 36 (School Lands), restricted to school purposes. The providing of special taxation for school purposes lies with the board or trustees of each school district, the limit of assessment being 10 mills.

NEW MEXICO.—School districts are established upon petition to the county school superintendent, the requirement being that there be not less than twenty-five children (or others desiring education) between the ages of 5 and 25 years, with the district. A compulsory school law fixes the legal age of children at between 7 and 14 years. The revenue derived from "School Lands" (after deducting cost of collection) is restricted to school purposes. In addition a territorial levy of 3 mills and further special taxes of not to exceed 15 mills, in rural districts, and not to exceed 20 mills in cities, may be assessed.

Citizenship—Right of Suffrage.

IDAHO.—The period of residence in the state necessary to acquire the right to vote is established at six months—length of residence in the precinct at thirty days (immediately preceding an election).

WYOMING.—Residence within the state for a period of at least twelve months is necessary to acquire the right to vote.

COLORADO.—Residence in the state, one year; in the county, ninety days, and in the precinct ten days, immediately preceding the election.

UTAH.—Residence in the state, twelve months; in the county, four months, and in the precinct, sixty days, preceding the election.

MONTANA.—Residence in the state, twelve months; in the county, thirty days, preceding election.

OREGON.—Residence in the state, six months.

NEW MEXICO.—Residence in the territory, six months.

Right of Women to Vote.

IDAHO.—Women permitted to vote to the same extent as men.

COLORADO.—Women permitted to vote to the same extent as men.

WYOMING.—Women (over twenty-one years of age) permitted to vote to the same extent as men.

MONTANA.—All women have the right to vote at school district elections, either for school trustees, upon the issuance of school bonds, or upon any other question submitted by the trustees of a school district. Women who are taxpayers have the right to vote upon all questions submitted, in accordance to law, to "taxpayers" (as distinguished from "electors," who must be male persons).

OREGON.—Women permitted to vote, in some instances, at school elections.

NEW MEXICO.—Women are not permitted to vote at any elections.

Right of Women to Purchase, to Hold and to Sell Property.

IDAHO, WYOMING, COLORADO, UTAH, MONTANA, OREGON and NEW MEXICO.—Women are permitted to purchase, to hold and to sell property to the same extent as men.

Liquor Option Laws.

IDAHO.—Liquor option in force by counties, townships, or state at large.

WYOMING.—No saloons may operate outside of incorporated towns. The county license is fixed at \$1,000, and the town license is fixed by the councils—usually at \$300.

COLORADO.—Liquor option in force by cities, wards or precincts.

UTAH.—Local communities, through county commissioners, city councils and town boards, have the power to license or to prohibit the manufacture or sale of intoxicating liquor.

MONTANA.—Liquor option in force by counties. Elections may be ordered by the county commissioners, upon petition.

OREGON.—Liquor option in force by counties.

NEW MEXICO.—No local option liquor laws. Precincts have the right to vote upon this question.

THE "CAREY ACT" (FEDERAL STATUTE) AND AMENDMENTS.

Section 4 of the act of August 18, 1894, entitled "An act making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1895, and for other purposes" (28 Stat., 372-422), authorizes the Secretary of the Interior, with the approval of the President, to contract and agree to patent to the states of Washington, Oregon, California, Nevada, Idaho, Montana, Wyoming, Colorado, North Dakota, South Dakota and Utah, or any other state, as provided in the act, in which may be found desert lands, not to exceed 1,000,000 acres of such lands to each state, under certain conditions.

The text of the act is as follows:

Sec. 4. That to aid the public land States in the reclamation of the desert lands therein, and the settlement, cultivation and sale thereof in small tracts to actual settlers, the Secretary of the Interior with the approval of the President, be, and hereby is, authorized and empowered, upon proper application of the State to contract and agree, from time to time, with each of the States in which there may be situated desert lands as defined by the act entitled "An act to provide for the sale of desert land in certain States and Territories," approved March third, eighteen hundred and seventy-seven, and the act amendatory thereof, approved March third, eighteen hundred and ninety-one, binding the United States to donate, grant and patent to the State free of cost for survey or price such desert lands, not exceeding one million acres in each State, as the State may cause to be irrigated, reclaimed occupied, and not less than twenty acres of each one hundred and sixty-acre tract cultivated by actual settlers, within ten years next after the passage of this act, as thoroughly as is required of citizens who may enter under the said desert land law.

Before the application of any State is allowed or any contract or agreement is executed or any segregation of any of the land from the public domain is ordered by the Secretary of the Interior, the State shall file a map of the said land proposed to be irrigated which shall exhibit a plan showing the mode of the contemplated irrigation and which plan shall be sufficient to thoroughly irrigate and reclaim said land and prepare it to raise ordinary agricultural crops and shall also show the source of the water to be used for irrigation and reclamation, and the Secretary of the Interior may make necessary regulations for the reservation of the lands applied for by the States to date from the date of the filing of the map and plan of irrigation, but such reservation shall be of no force whatever if such map and plan of irrigation shall not be approved. That any State contracting under this section is hereby authorized to make all necessary contracts to cause the said lands to be reclaimed, and to induce their settlement and cultivation in accordance with and subject to the provisions of this section; but the State shall not be authorized to lease any of said lands or to use or dispose of the same in any way whatever, except to secure their reclamation, cultivation and settlement.

"As fast as any State may furnish satisfactory proof according to such rules and regulations as may be prescribed by the Secretary of the Interior, that any of said lands are irrigated, reclaimed and occupied by actual settlers, patents shall be issued to the state or its assigns for said lands so reclaimed and settled; provided, that said state shall not sell or dispose of more than one hundred and sixty acres of said lands to any person, and any surplus of money derived by any state from the sale of such lands in excess of the cost of their reclamation, shall be held as a trust fund for and be applied to the reclamation of other desert lands in such state. That to enable the Secretary of the Interior to examine any of the lands that may be selected under the provisions of this section, there is hereby appropriated out of any moneys in the treasury, not otherwise appropriated, one thousand dollars."

FIRST AMENDMENT.

In the act making appropriations for sundry civil expenses of the government for the fiscal year ending June 30th, 1897, and for other purposes, approved June 11th, 1896, there is, under the head of "appropriation for surveying public lands," the following provisions:

"That under any law heretofore or hereafter enacted by any State provided for the reclamation of arid lands, in pursuance and acceptance of the terms of the grant made in section four of an act entitled, 'An Act Making Appropriation for the Sundry Civil Expenses of the Government for the Fiscal Year Ending June Thirtieth, Eighteen Hundred and Ninety-five,' approved August eighteenth, Eighteen Hundred and Ninety-four, a lien or liens is hereby authorized to be created by the state to which such lands are granted and by no other authority whatever, and when created shall be valid on and against the separate legal subdivisions of land reclaimed for the actual cost and necessary expenses of reclamation and reasonable interest thereon from the date of reclamation until disposed of to actual settlers; and when an ample supply of water is actually furnished in a substantial ditch or canal, or by artesian wells or reservoirs, to reclaim a particular tract or tracts of such lands, then patents shall issue for the same to such state without regard to settlement or cultivation; provided, that in no event, in no contingency and under no circumstances shall the United States be in any manner directly or indirectly liable for any amount of any such lien or liabilities in whole or in part."

SECOND AMENDMENT.

The limitation of time in the above quoted section 4 was modified by section 2 of the act entitled, "An Act Making Appropriations for Sundry Civil Expenses of the Government for the Fiscal Year Ending June Thirtieth, Nineteen Hundred and Two, and for Other Purposes," approved March 3d, 1901 (31 Stat. 1133-1188), which provides as follows:

Sec. 2. That section 4 of the act of August 18th, 1894, entitled, "An Act Making Appropriations for Sundry Civil Expenses of the Government for the Fiscal Year Ending June Thirtieth, 1895, and for other purposes," is hereby amended so that the ten years' period in which any state shall cause the lands applied for under said act to be irrigated and reclaimed, as provided in said section as amended by the act of June eleventh, Eighteen Hundred and Ninety-six, shall begin to run from the date of approval by the Secretary of the Interior of the State's application for the segregation of such lands; and if the state fails within the said ten years to cause the whole or any part of the lands so segregated to be so irrigated and reclaimed, the Secretary of the Interior may, in his discretion, restore such lands to the public domain.

Amendment of March 15, 1910.

To overcome the difficulty of contending with speculative filings upon land, while being surveyed for the purpose of applying for its segregation, the following amendment was adopted March 15, 1910:

"An Act authorizing the Secretary of the Interior to make temporary withdrawals of public lands for certain purposes."

"That to aid in carrying out the purpose of section four of the Act of August eighteenth, eighteen hundred and ninety-four, entitled, 'An Act making appropriations for sundry civil expenses of the government for the fiscal year ending eighteen hundred and ninety-five, and for other

(Continued on page 386.)

CIMARRON, KANSAS

In the Work of Earth Regeneration, "Save the Water" is the Slogan.

When the miners, freighters and cowmen followed the old Santa Fe trail out across Kansas, and into the foothills of the Rockies, in the middle of the last century, they encountered what was known as the "Great American Desert." There were immense stretches of flat or gently rolling land which looked bare and uninviting, for the fields had not yet given up their secrets or betrayed their wonderful productiveness. Through these fields wandered, sluggishly, the Arkansas river, sometimes seeming to dry up entirely, and at rare intervals being filled with a roaring flood of snow-water from the mountains and rain-water running from the "trampled pavement of the sod," unchecked by spongy plowed ground.

In those days they used sometimes to take the "Cimarron Crossing," and strike off across the upland toward the Cimarron river, because it shortened the distance. This was considered rather foolhardy, however, as the supply of drinking water was almost a minus quantity in the stretch between the two rivers. They did not know that this stretch was underlaid by artesian water and shallow strata which is now making an emerald alfalfa field of a large part of this section.

Three miles east of the "Cimarron Crossing," the town of Cimarron now stands.

When the motor tourists travel out over the "New Santa Fe Trail" from Hutchinson, west of the state line, they see a far different country than did the travelers on the old trail. The story of the transformation of western Kansas reads like a romance. Seemingly accomplishing the impossible, those who have stayed with it and have used careful scientific methods of soil culture, have demonstrated that farming even on the highest upland, is highly profitable—as profitable as anywhere in the state. On the lowlands, especially in the great Arkansas Valley, the miracles of irrigation are being wrought.

The New Santa Fe trail was the conception of those who wanted western Kansas to have a working model, a pattern of good road building. Example is better than precept, and the best way to build good roads is first, to build them and second, to keep on building them. Preaching good roads won't help much. Building a demonstration model will help a lot. And it was considered especially apt that this great demonstration highway should perpetuate the name of the Old Trail. The "Cimarron Jacksonian" made a campaign for the highway, and pro-

portance in advertising the road, as all the large publications lay particular stress on the apt association of the old and the new, the historical and the practical, in this



View of the New Santa Fe Trail—Cimarron, Kansas.

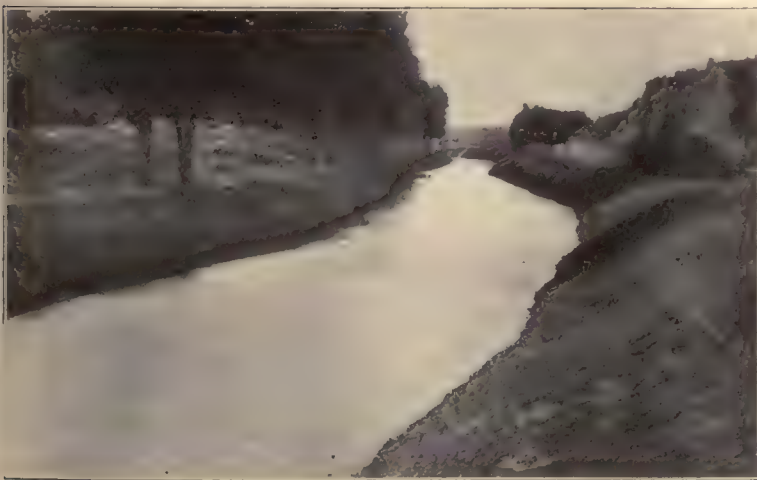
great enterprise. Plans are already being laid, under the leadership of the Kanass City Star, to extend the trail east from its present eastern terminus, Newton, to Kansas City, and Colorado good roads enthusiasts are already working the highway westward, so in time the entire route of the Old Trail will be covered by a modern thoroughfare, through the once so-called Great American Desert, and on toward the Pacific coast.

The regeneration of this great kingdom is being accomplished by irrigation and scientific dry farming. The whole section is "greening up," and is assuming the aspect of a garden spot, the gem of which is the Arkansas Valley. It is lined with alfalfa fields, fine groves of trees, beet and truck patches, and studded with thrifty and prosperous little towns.

The seeming dry bed of the Arkansas has been forced to give up its secret, the inexhaustible underflow. The Cimarron district is now being put under the ditch of the first comprehensive sump seepage system of irrigation. By gravity the underflow is allowed to run into a large irrigation ditch, and on down the valley. It is the simplest thing in the world and will make irrigationists all over the world sit up and take notice. This Eureka project, as it is known, is financed by a million or more, and everything is being done in a permanent and substantial manner.

The accompanying cuts show views of the New Santa Fe Trail along the already flowing ditch of the Eureka system. This gives an idea of the blooming of the desert and the pretty scenery to be found along the modern Appian Way, the New Santa Fe Trail, which follows the famous fertile Arkansas river valley.

The Cimarron district will soon rival the neighboring Garden City district, as it has the added advantages of the modern and economical sump ditch system. It needs only to be fully developed to bring the rich returns. Garden City is only thirty-four miles up the valley; Dodge City is twenty miles down the valley. The district is strategically situated and is sure to be developed.



New Santa Fe Trail Along the Flowing Ditch of the Eureka System—Cimarron, Kansas.

posed that a new Santa Fe Trail be adopted. It hampered away on the proposition, and saw the name adopted, which subsequent events have shown to be of great im-

The Story of Arapahoe Joe

J. F. Crawford, Wyoming.*

When I first came to Saratoga, Wyoming (then called Warm Springs), in 1878, I became acquainted with Frank Williams, a man who had been on the plains and in the Rocky Mountains since 1865. He often rode a compactly built buckskin stallion, with a very long, silvery white mane and tail, both of which reached the ground. His foretop was so heavy that I had to part it to see his eyes. He was one of the most remarkable horses I ever saw. While perfectly kind and bidable, he was the most intensely alive of any animal I ever saw. He took a most absorbing interest in life and nothing escaped his watchful eye. He seemed to never tire, and no road was too long for his short, springy lope. When I asked Williams about him he remarked that there was a very interesting story connected with the horse and related the circumstances by which he came into possession of the animal, which I will give in his own words:

"It was during the winter of 1873-4. Myself, and four other white men, were encamped for the winter with a band of Ute Indians, at the junction of the Yampa and Green rivers, in the extreme northwestern part of Colorado. Our camp was on the tongue of land between the two rivers, in a heavy growth of cottonwood timber. It was an ideal spot for a winter camp, for we were well sheltered from storms, grass was good for the horses and game was abundant.

"There were some twenty teepees in the Indian village and we were on friendly terms with its inhabitants, as we had shared in their fall hunt for their winter's meat. So we came and went as we pleased, and the old men of the tribe, as well as the young warriors, were often friendly visitors at our campfire.



View at Spillway of Ditch—Cimarron, Kansas.

"The weather was fine for a couple of months, when there came a snow a foot in depth which, owing to the sudden drop in the temperature, crusted over solidly, so that it would easily bear the weight of a man. This was followed, in a few days, by another foot of snow and this, too, crusted over; and still another foot of snow, and another heavy crust, and yet another fall of a foot, and another firm crust. All this took place inside of ten days. It was something very unusual, so the Indians told us, and the old gray-headed men of the tribe would come around and protest that in all their lives they had never known such a thing to occur in that country before. They prophesied that when the moon fulfilled there would come a rain and wash it all away.

"But the moon waxed and waned and still no rain. This alarmed the Indians very much. They began to show uneasiness, fearing they had, in some way, offended their rain-god. The medicine man of the tribe called a council and it was determined that something must be done to propitiate the offended deity, and to this end they assembled in one of their teepees to sing their rain song.

"It would be impossible to describe the nature of that chant; it was indescribably weird, and seemed to have in it the voices of the wind, the water, the growing leaves and grass, all blended into a harmonious whole, and exactly imitated the gentle patter of the rain on a tent cover. Indeed, it was so realistic that often, in the dead of the night, I would put my hand to the tent, feeling sure that it must be raining.

"In consequence of the very deep, crusted snow, which covered all the country like a mantle, the game had nearly all left that part of the range. What remained grew so poor that it was not fit for food. But we were compelled to eat it, such as it was. One of our party, an Englishman, was very fond of fat meat. He would sit by the campfire for hours at a time, watching a pot of boiling meat, simply to note the little globules of fat that rose to the surface, calling them 'birds' eyes.' But one day, during this period, he arose from this occupation with the disconsolate remark: 'Ah, boys! there's nary a birds' eye there.'

Mr. Crawford is the publisher of the Saratoga Sun and is one of the oldest and most highly esteemed citizens of his district.

"The scarcity of meat soon made itself felt in the Indian village. They had drawn their winter's supply of flour from the Agency in the fall, but, with their proverbial lack of thrift and the unusual demand made upon it by the lack of game, it had given out, and the entire village was reduced to meat straight—and a very poor quality at that. As for the older people of the tribe, they had been accustomed to a strictly meat diet before they came under the fatherly care of Uncle Sam, and were not so much distressed by this state of affairs; but the children, and especially the papposes, found it a great hardship to live on meat alone. Many of the little fellows, those under the age of six years, sickened and died by reason of the lack of 'biscuit,' as they called bread made of flour. It was most pitiful to hear their little feeble voices, all over the camp, crying for 'biscuit,' 'biscuit.'

"It was a very common sight, during that trying period, to see a squaw go out to the edge of the camp, dig a hole in the snow, and lay away some little form in its last sleep, that had literally died of starvation.

"In this tribe was a sub-chief by the name of 'Arapahoe Joe.' I never could learn how he, a Ute Indian, came to have such a name—the name of the hereditary enemy of his race. This chief was a fine looking fellow, fully six feet tall, and as straight as an arrow. He had but one child, a boy of about five years of age, I should say. This little fellow, the very apple of his father's eye, had, so far, escaped the fate of nearly all of the other papposes of the village. The mother had secreted a little flour and had doled out a 'biscuit' a day to the little one, denying her husband and herself a single taste of the luxury. Bye and bye this little hoard gave out, and it was not long until the little one fell sick for lack of it. His feeble little wail for bread was most heart-breaking, indeed. It seemed certain that he, too, must die and be buried in the snow that hemmed us all in, like a great frozen ocean, whose bounds none of us dared attempt to pass.

"At the most desperate stage of this famine Arapahoe Joe came to me and proposed a horse-trade. I had a fine, large, iron-gray horse, that I set much store by, he was so strong and full of life and energy. We called him an 'American' horse to distinguish him from the Indian ponies of the country. Joe wanted to trade for him and offered me four good animals from his herd in exchange.

"I readily agreed to the trade, and he brought me four horses, the pick of his bunch and, in addition, a little two-year-old buckskin colt.

"I said, 'Joe, these four horses are enough; I do not want that little fellow. He would only be a bother to take care of and I am satisfied with the others.'

"Then Joe, in his broken English, explained that the colt belonged to his pappoose, and if the little fellow died, as he feared he would, it would be necessary, according to the custom of his race, to kill the pony. He said he had become attached to the colt and did not like the idea of having to kill it, and begged me to take it, explaining that he would kill some other horse if the boy died, which would do quite as well.

"His appeal was so urgent and he seemed to feel so keenly the duty of having, if necessary, to kill the colt, that I yielded and took the little animal into my herd. I had often noted the great bond of sympathy that seemed to exist between the pappoose and the colt. When Joe would bring his herd into camp he would always place the little one astride of this pony, and it would wander around among the other horses, while the boy amused himself with a string, trying to lasso the animals in the bunch, in imitation of what he had seen his father do.

"Joe had no sooner come into possession of the big gray than he began to saddle the animal and make every preparation for a journey.

"I was interested and asked:

"Joe, what are you going to do?

"'Goin' Brown's Hole,' he explained, 'get flour for pappoose. Pappoose heap sick; must have biscuit; no get biscuit, pappoose die.'

"By this time the rest of our crowd had become interested and they all joined me in trying to dissuade the Indian from trying such a foolish thing as to start out on a journey of any kind so long as that snow held on. But to all of our protestations he would only say: 'Must get biscuit for pappoose,' and continued his preparations for the trip.

"And so he started for Brown's Hole, forty miles distant, as the crow flies. We all gathered around to watch him off, fascinated by the daring courage of the man. Indians are always very indulgent to their children, rarely ever correcting and never punishing them. I had never beheld any very great sacrifice on the part of any Indian parent for his child and I never suspected that any of them would risk their lives, like this one was going to do, in order to save the life of one of their children. I knew that so far as Joe, himself, was concerned, he would have sat down and stoically starved to death without a murmur. He would probably have shown the same stolid indifference to the death of his squaw, or any other member of his tribe, but that little, feeble wail of 'biscuit,' that was going up from his wigwam, had moved him as nothing else on earth had ever done before and he was now ready to take his life in his hands and face almost certain death, out on that treacherous expanse of snow, that ocean of ice and frost, which not even the biting wind from the north had been able to make an impression upon.

"We all stood there, amazed at what we saw, watching Joe and his horse plunging in the snow. The iron gray, a heavy animal, was breaking through the crust at every stride, rising and falling, like a boat on troubled waters. When they had become a mere black speck on the horizon someone suggested that we gather our belongings and follow him.

We were all panicky in a moment and began feverishly to pack our things.

"Our own supply of provisions was almost exhausted and we knew that it meant starvation if we could not get out to some place where we could obtain a fresh supply. And so, with desperate haste, we gathered our camp belongings and made ready for the journey. We had thirty head of ponies, and these we drove ahead of us to break the trail. It was 9 o'clock in the morning when we broke camp and, with all the haste of desperate men, we struggled through that terrible sea of ice and snow until sunset and made camp for the night, after having succeeded in placing only twelve miles between us and the Indian village.

"We were too tired to do anything but make the most primitive camp and lay down exhausted, where we slept the dreamless sleep which comes to one after a day of hard toil.

"The next morning, at daylight, Arapahoe Joe came into our camp, on his return journey. He stopped long enough to melt some snow for his horse. He refused all offers of breakfast and pushed on homeward with as little delay as possible. Behind his saddle was tied a fifty-pound sack of flour. The iron gray was only a shadow of his former self, though still nervy and willing. When Joe mounted him for the final twelve miles he staggered along the trail for a little ways, then, seeming to scent the end of his journey, he straightened up and went bravely onward, for his road was now a comparatively easy one to the rough trail left in the rear. We calculated that the Indian would arrive at the village about 9 o'clock that morning, making the journey of eighty miles in twenty-four hours.

"Our party worked valiantly for three days more before it reached Brown's Hole, weary and half famished. Two of the party had become snow-blind and did not recover their sight for weeks. It had taken us four days of the hardest travel any of us had ever known, assisted by thirty head of horses, to break the trail, to make half the distance accomplished by Joe and the iron gray in one day's time. I look back now on that trip as being the severest physical strain I ever endured in all my life in the West.

"Did Joe arrive in time to save the papoose? Oh, yes; there is no doubt about that, for in after years I met Joe and his family and there was a sturdy young lad of ten or twelve, who was already aspiring to be one of the warriors of the tribe. And the iron gray was there, too, fat and sleek, one of the most valued possessions of the entire family."

Williams named the colt "Arapahoe Joe," and by that name he was called to the day of his death. He became the head of the Williams' herd of horses and left a hardy line of progeny, one or two of which are still to be seen here in the valley. This horse had a strange and unaccountable antipathy to any animal of a bay color and he would not allow a bay horse in his herd. He invariably drove them out and the only way they could be found was to give Old Joe a sound beating with a cow-whip and he would take the trail and lead you to the animal, standing in some gulch, badly bitten and bruised, for Old Joe was a terror.

"I put a little bay mare in his herd one time, not thinking he would drive a mare from the bunch," said Williams, when explaining about this trait of Old Joe's. "When I went out the next day the little mare was gone. I lit into Old Joe with my cow-whip and chased him around the bunch three or four times, when he started off toward the mountains. I looked down at the ground and saw he was following the trail. He led me away up in the mountains and there, standing under the pines, was the poor little mare, all bruised and bitten, feebly fighting the flies that swarmed around her.

"We did everything we could think of to put a stop to Old Joe's cruelty, but without avail. We hopped him, but it did no good. We tied his head to his front foot, but he went merrily on with his punishment of bay horses. Then we plaited heavy iron in his foretop. He bruised his head until his eyes were swelled almost shut—but he kept the bay horses out of the bunch as well as when he was unhampered. We finally gave it up as a bad job and let Old Joe have his way."

Williams kept the animal until he was twenty years old, when a man from Buffalo, N. Y., took him to his home, broke him to drive and the last I heard of him he was being driven around the streets of that city, hitched to a phaeton, by a little flaxen-haired girl, who was very proud of her strange steed. And there he probably ended his days. He was of noble blood and could trace his ancestors back to the time when they came over from Spain, with Cortes, to conquer Mexico.

IDAHO STATE LAND REGISTER RESIGNS.

Former State Land Register, M. J. Church, secretary of the Idaho State Board of Land Commissioners, on April 20th, tendered his resignation, to take effect at once. It was immediately accepted and the position vacated was filled, temporarily, by the appointment of Mr. Heber Q. Hale, one of the deputies under Mr. Church's regime, as Acting Register, pending the permanent appointment. It is understood that Mr. Church some time ago decided to engage in private practice as attorney and advisor for Carey Act companies, and his decision was hastened by differences of opinion as to the conduct of his office.

RECENT MAGAZINE ARTICLES RELATING TO IRRIGATION AND DRAINAGE.

Farm Land Development and Allied Subjects.

JOURNAL OF POLITICAL ECONOMY—Chicago
"Pioneer Industry in the West"—April.

REVIEW OF REVIEWS—New York City.

"Lessons from Western Fruit Culture for the East"—April.

"Water Power Sites on the Public Domain," by Secretary R. A. Ballinger—January.

"Advance of Forestry in the United States," by Chief Forester H. S. Graves—April.

SCIENTIFIC AMERICAN—New York City.

"Government Irrigation in the Yakima Watershed"—April.

OUTLOOK—New York City.

"How to Pay for Reclamation"—May 7.

"Water Savers"—March 26.

"The North Pole of Alfalfa"—June (monthly).

HARPER'S WEEKLY—New York City.

"Seamy Side of the Reclamation Service"—April 9.

AMERICAN HOMES—New York City.

"Open Air Orchard Heating"—March.

WORLD'S WORK—New York City.

"Highways of Progress," by James J. Hill.

(a) Future of our Waterways—April.

(b) Conservation of Capital (last article of famous series)—May.

SCRIBNER'S MAGAZINE—New York City.

"Railway Rate Battle in the West"—March.

CASSIER'S MAGAZINE—New York City.

"Irrigation and Engineering"—April.

HAMPTON'S MAGAZINE—New York City.

"Adding Three States to the Union"—April.

COUNTRY LIFE—New York City.

"Drainage of Farm Lands"—April.

PUTNAM'S MAGAZINE—New York City.

"Reclaiming the Everglades."

NORTH AMERICAN—New York City.

"Other Side of Conservation"—April.

"OVERLAND" MONTHLY—San Francisco, Cal.

"The Conquest of the Half-Desert"—May.

MOODY'S MAGAZINE—New York City.

"The Speculation in Land"—May.

"The Canadian Pacific Railway"—May.

TECHNICAL WORLD—New York City.

"Great Rival of the Panama Canal"—June.

"Final Work on the Roosevelt Dam"—June.

"Our Proudest Ancient Ruins"—June.

NATIONAL GEOGRAPHIC MAGAZINE—Washington, D. C.

"The Spirit of the West," by C. J. Blanchard, Chief Statistician, United States Reclamation Service—April.

AMERICAN FORESTRY—Washington, D. C.

"The Hetch-Hetchy Valley," by John Muir—May.

POPULAR SCIENCE MONTHLY—Lancaster, Pa.

"The Reorganization of American Farming."

EVERYBODYS—New York City.

"Southward Ho!"—June.

PACIFIC MONTHLY—Portland, Oregon.

"The Men of the Pony Express"—May.

"The Arid West—Cradle of the Best American," by Edward L. Munson, A. M., M. D.—May and June.

"Following the Colonists"—May.

IRRIGATED FARM LANDS

Of the Arkansas Valley of Colorado Under the Amity Canal and Reservoirs

Did you ever hear of the Arkansas Valley?

When you ate that juicy Rocky Ford cantaloupe last fall did you know where Rocky Ford was?

Did you know that three times every day you used sugar made in the Arkansas Valley?

What about the alfalfa and alfalfa meal you feed the milk cow, did you know it was grown in the Arkansas Valley?

These products which you use every day are grown equally well from the Kansas line west to Pueblo. Here the water of the Arkansas river, diverted from its original channel, winds in dozens of canals out into the smooth table lands where it has redeemed hundreds of thousands of acres of arid lands and made them into homes for thousands.

The eastern farmer worn out by many years of drouth or floods in the East, has made his home here in the Arkansas

you think it would be in answer to your prayer? No, it would merely be a coincidence. When it did rain, would it rain on your corn alone? No, it would rain on your corn, wheat, garden, roads and on everything that a rain would harm as well as on crops it would help.

A rain is no respecter of persons or things and even you would be driven to shelter where you would probably send forth as fervent prayers to have the rain cease as you had previously done to have it commence.

This is the secret of the success of farming by irrigation. The rain is subject to the call of the farmer. He can use it on the crops that need it and can keep it off of those that don't. His roads are always dry and every day is such that he can be out at work.

To secure this ample supply and even flow of water, two things are of paramount importance. First, that the lands to be irrigated have, besides a direct flow of water from the stream from which it irrigates, a supply of storage water to fall back on large enough to carry them through such times that this stream may be low.

The Amity Canal which irrigates 75,000 acres of land in the Arkansas Valley in Prowers County, besides one of the earliest priorities on the Arkansas river, which assures



View on Kicking Bird Canal. This canal is the inlet to the reservoirs. It is 80 feet wide on the surface of water.

It is 36½ miles long and although not full when this view was taken, it has a capacity of 1,000 second feet.

Valley where this item, so essential to successful farming,—plenty of water at the proper time,—is assured. Suppose you who are farming in the rain belt, look over your corn crop and say "this needs a rain." Can you get it? You might pray for rain for hours and all your neighbors might be helping you, but you would not get it. Suppose after spendings days of anxiety praying for rain and watching your corn crop burn up in the sun, there should come a rain. Do

it of an ample supply of direct flow water, has the largest reservoirs in the country in which to store its water. These reservoirs cover 13,000 acres of land and contain an available supply of 167,000 acre feet of water or enough water to cover 167,000 acres one foot deep.

An article appearing in this magazine last month explained the sufficiency of these reservoirs. This article will confine itself more to the construction work of the Amity

Canal and its tributaries. The construction work is the second essential factor for success in a well organized irrigation system. Without the best kind of construction work an even flow of water is not assured.

Every dam, flume, drop, measuring weir and waste gate in the Amity Canal is made of solid concrete reinforced with steel. The dam in the Arkansas river which diverts the river water into the Amity Canal is 504 feet long and 28 feet high from crest to base. It is composed of concrete and is well bolted to bed rock. This dam was subjected, a year ago last October to as severe a test as could be possible. On that date the river reached a higher point than it was ever known to reach before, but the Amity dam, constructed at a cost of \$125,000 by the best engineers in the country, was not damaged in the least.

To the right of the view below may be seen the head-

To the left of the above view may be seen the point at which the Comanche Canal, the outlet to the reservoirs, joins the Amity Canal. From the reservoirs to this point, a distance of 14 miles, there is a fall of 279 feet. Were some sort of construction not made to prevent the rush of water it would be impossible to control the Comanche Canal. To prevent the washing out of the canal, eleven concrete drops were built at different points along its course. The water runs along smoothly until it reaches one of these drops when it plunges down 12 to 15 feet onto solid concrete. The cut below is one of the eleven drops in the Comanche Canal.

The Arkansas Valley Sugar Beet & Irrigated Land Company which built the above works, and owns the lands lying under the Amity Canal, has its headquarters at Holly, Colo., just four miles from the Kansas line. This town shows evidence of the productiveness of the lands surround-



Division Gate No. 1—Kicking Bird Canal. Note the solid appearance of the concrete work and the patent gates which are also made of reinforced concrete.

gate of the Amity Canal. The gates are set in solid rock and the water flows through a tunnel in the rock.

From the dam the Amity flows about 30 miles through smooth plains until it comes to Sand Creek, where it joins the water from the reservoirs. The crossing of Sand Creek was always a serious problem until it was decided to go under instead of over the bed of the creek. Three concrete tunnels were made under the bed of the creek, 22 feet below its surface. On these tunnels rests a concrete bridge for use of automobiles and wagons. The view below shows the bridge above the siphon. The waters of the creek pass over the siphon, under the bridge and between the piers. The length of this siphon from intake to outlet is 380 feet. The water enters the siphon at the end of the bridge on the left and comes out to the right of this view.

ing it. It has sprung, in the past twelve years, from a barren desert to a thriving little city of 1500 people. Every soul of the 1500 has "Help Holly Hustle" for its motto and led by the Holly Commercial Club they will soon make Holly a town of 5,000 people.

Capitalists of Reno, and other Nevada cities, have applied for the right to reclaim 200,000 acres in the Amargosa Valley. This land lies in the new county of Clark and extends south from Gold Center to Parhump. It is claimed that the company is ready to spend \$4,000,000 in reclamation work. Water available is sufficient to irrigate 10,000 acres, but it is supposed that subterranean streams can be tapped for a much larger supply.

MONTE VISTA, COLORADO, AND THE SAN LUIS VALLEY.

The thousands of irrigationists who will attend the meeting of the National Irrigation Congress and the Exposition in connection therewith at Pueblo Colorado, September 25th-30th, will have many opportunities to see all kinds and varieties of irrigation. Most of them will make a two to four weeks' trip, and not only take in the work of the congress, but will also visit the famous scenes of America's playground from Denver to Pike's Peak and over to the west slope. They will also be able to visit the great valleys of Colorado, the Arkansas, the Grand, and the San Luis, where they may observe the hundreds of thousands of acres of desert that have been reclaimed and how the live wires of the West are doing it.

The San Luis Valley will prove a great astonishment to the uninformed. Within a few hours run from Pueblo one has crossed a range of mountains, and there suddenly comes in view a great basin or saucer 150 miles long by 40 miles wide and almost as level as a floor. This country was at one time a lake extending from the Sangre de Christo mountain range to New Mexico, but now the

The two banks of Monte Vista now have deposits exceeding \$800,000. The beautiful new addition of Sunnyside, now being completed, is only four squares from the center of town.

Last year Monte Vista shipped 2,717 carloads of livestock and farm produce. This shipping has been showing an increase every year.

Two new ventures on a large scale promise immediately great improvements to Monte Vista. First a sugar beet mill, second a railway to Center, fourteen miles, and later to be extended south. This railroad will offer the means to the farmer to ship his sugar beets, which have not been developed on a large scale yet, but promise to be one of the main products of the valley. Center is now a live town, although fourteen miles from a railroad, but building rapidly in anticipation of it.

Under the present irrigation systems of the San Luis there are now constructed 1,200 miles of canals and laterals. At present most of the ranches are large, the 160-acre unit being the smallest, and only a few of them. As water rights are so cheap, in many cases not exceeding a total cost of \$7 per acre, these will eventually be divided into smaller units and as intensive farming fol-



One of the Eleven Drops in the Comanche Canal, Arkansas Valley.

Rio Grande finds its headwaters up north of Creede and flows placidly through this valley southward.

This level basin includes 3,800,000 acres, and last year 500,000 acres were under cultivation by direct irrigation from the Rio Grande. No flood waters have yet been conserved, and it is safe to say that a total of 2,000,000 acres could be and eventually will be irrigated, because of the plentiful supply of water.

Of this vast territory 169,000 acres is tributary to the town of Monte Vista, and 120,000 of that was under cultivation last year.

Monte Vista has a population of 3,000 people, and in all directions one may see the snow-capped peaks rising to the sky, while nearer at hand thousands of acres of wheat, oats, field peas, alfalfa and potatoes are bringing fortune to the lucky pioneers who have come to this beautiful spot. Many flocks of sheep and droves of hogs, fattened by these peas are now adding to this income.

There are few finer homes to be seen in the big cities of the East than those that grace the city of Monte Vista. There are there 96 automobiles, mostly large touring cars, and in this valley magnificent roads make touring a continual pleasure.

lows, so will population increase, both in the country and in the towns. This may be termed the frontier of irrigation and presents marvelous opportunities to the land-seeker.

Send \$2.50 for The Irrigation

Age one year and

The Primer of Irrigation

SAN LUIS VALLEY ORGANIZED.

Business Interests Plan Association Similar to That of
Arkansas Valley Commercial Club.

The success of the Arkansas Valley Commercial Association, a central body of commercial clubs of the valley, has been so pronounced and the idea has taken so well that various other sections of Colorado are taking the matter up.

The San Luis Valley has recently held a conference and decided to form such a central organization in the near future. This conference was held at Alamosa and was largely attended. It was addressed by Arthur Hooker, secretary of the National Irrigation Congress, who has been very much interested in the work of organization in these various sections, and particularly in the San Luis Valley, and by R. H. Faxon, secretary of the board of control of the Eighteenth National Irrigation Congress and president of the Arkansas Valley Commercial Association.

The San Luis Valley offers a splendid opportunity for concentrated work. It comprises four counties, hemmed in

(Continued from page 357.)

Many new settlers are coming into the North Platte Valley each year, and are engaging in ranching, with stock raising as an adjunct. This arrangement is particularly suitable for this locality, owing to the great ranges on the mountains and foot-hills. Many sheep are raised in this section, and ranch.

As previously stated, we have arranged with Mr. Crawford, editor of the *Saratoga Sun*, who is a pioneer in that section, to write for us, a series of stories and reminiscences of his early experiences, as well as that of many of the older settlers in that territory. We believe that this matter will be most interesting to our many readers.

Saratoga has an active Commercial Club, with Mr. Lon A. Tuttle, cashier of the First National Bank, as president. Mr. Tuttle is known as one of the "live wires" of that section, and it is said that he and Mr. Crawford have done more than any other two men, to attract attention to the North Platte Valley.

In this connection we will call attention to an opportunity which is offered to those who would be inclined to go there and enter into the hotel business.

Mr. F. G. Wolf, who is proprietor of the Hotel Wolf, and who has been there since the early days, developed this



Dam in the Arkansas River. Arkansas Valley Sugar Beet & Irrigated Land Company's Project.

by mountain ranges, of the most promising and fertile nature. Irrigation is very largely from the Rio Grande river, which flows in a southeasterly direction through the valley. There is also a probable pumping future in the valley, although this would mean a change of crops. The crops mostly raised are wheat, barley and peas. The San Luis Valley is getting to be a great hog raising section on account of the vast quantities of peas and the nutriment contained in this product.

One of the reasons for the organization of the central commercial association of the valley was to bring the possibilities of stock fed on peas to the attention of the farmers of the middle West.

The San Luis Valley also has a beet mill prospect and a sugar company is now organized and at work at Monte Vista getting the acreage necessary for next year and experimenting in the various sections throughout the valley this year.

The valley is strongly backing the irrigation exposition. A comprehensive representation and display from the valley, as a whole, will be made at the exposition, September 26-30, 1910.

property, and informs us that the necessity for keeping an invalid member of his family in a lower altitude, compels him to turn this hotel (an illustration of which is presented herewith), over to some one, who will conduct it along the right lines. Mr. Wolf will either sell the furniture in the hotel and give a lease on the property, or will sell outright.

The property is located on a prominent corner in the town of Saratoga; is in easy walking distance of all the springs and bath houses, and is the best equipped institution of its kind in the North Platte Valley. The half-tone shown herewith was made from a photograph taken during the old stage days, before the advent of the railway. It shows one of the old time overland stages drawn by six horses. This, in those days, was considered a luxurious method of traveling, as compared with the old freight wagons or cow ponies, on which the majority of the early settlers reached that section.

In a future issue, we will present statements from Mr. Tuttle, and others, concerning the crops which may be profitably produced in that section. Facts will also be given as to the profits to be obtained from the sheep and cattle business conducted on either a large or small scale.

MANY YEARS OF PLENTY

**Lands in Antelope Valley, New Mexico, Near French
Land and Irrigation Company's System, Have Long
Demonstrated Wonderful Fertility**

The real test of the value of farm land is the amount of money it will produce per acre. While its sentimental value, due to location, proximity to large cities, and climate, is sometimes considered and tends to increase its selling value, as a commercial proposition, and an interest paying investment the amount of cold, hard dollars you can derive from

Alfalfa 5 tons per acre, worth \$12.00 per ton.

This gives the value per acre of these four staple crops as follows: Oats, \$48.00; barley, \$48.00; wheat, \$45.00, and alfalfa, \$60.00.

These may appear large to the eastern farmer, but these figures are fully borne out by the facts. It is simply the old question of an extremely fertile soil made productive by supplying sufficient water when it is needed. There is no question of drouth, excessive rainfall, or driving storms to ruin the crops. It is just the right amount of water applied when it is needed that produces these results. These same results could be obtained in the fertile lands of the Mississippi Valley if that one question of sufficient rainfall at the right time could be eliminated. Besides these four staple crops the Antelope Valley will and does produce immense yields of fruits, vegetables and sugar beets.



Reservoir No. 2, Showing Intake from Rivers. French Land and Irrigation Company's Property.

it is what the average business man and farmer really considers.

While the lands of the French Land and Irrigation Company are new and figures from these lands are consequently impossible to obtain, we have the experience of a large number of farmers in the Antelope Valley, who have been cultivating lands on all sides of the French tract for a number of years. These early pioneers while laboring under all the disadvantages which greet the first settler of any new country, have crowned their efforts with results such as we have seldom seen in any country we ever visited.

From the most careful and conservative figures that can be obtained from men who are thoroughly reliable and have successfully farmed in the Antelope Valley for years, one can not fail to realize that the French Land and Irrigation Company, have a project that as a money maker either to the investor or the farmer cannot be excelled anywhere in the country.

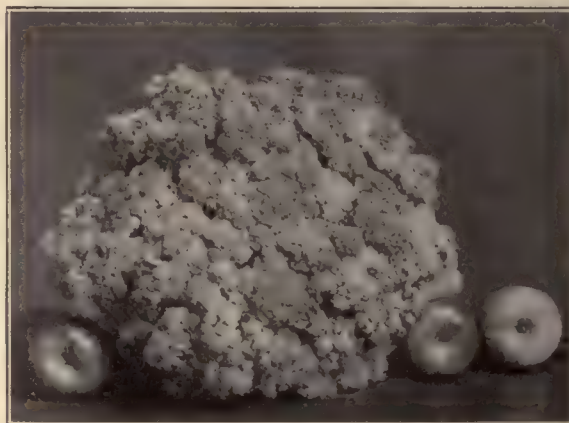
The main crops that have been grown in the Antelope Valley are oats, wheat, barley, alfalfa, fruits and vegetables. Corn has been grown to some extent and yields of from forty to fifty bushels per acre have been obtained. We do not intend in this article to give what can or have been raised under extraordinary circumstances, but what every farmer should and will raise under careful and intelligent management.

Oats 75 bu. per acre, average price, \$2.00 per 100 pounds.

Barley 50 bu. per acre average price, \$2.00 per 100 pounds.

Wheat 45 bu. per acre, average price, \$1.00 per bu.

At the National Irrigation Congress, held at Albuquerque, New Mexico, in 1908, sugar beets from the Antelope Valley took the first prize in competition with practically every



Cauliflower Grown Near French, New Mexico. Weight, 30 lbs., when Taken from the Ground.

sugar beet country, and sugar beets grown here excel in sugar

(Continued on page 397.)

Reclamation Notes

CALIFORNIA.

At a recent meeting of the Board of Supervisors at Marysville, members of the Hallwood Irrigation Company appeared before the Board with an appeal for assistance from the county in bearing expenses of the necessary pipes for the points where the main ditch and laterals of this project cross the county roads. The bill set forth the facts that the company is composed of taxpayers of Yuba county and as their initial expense in installing the system is very great they would like to have the county pay for the culverts. The bill also states that the land to be benefited by the proposed irrigation system consists of 6,000 acres lying northeast of Marysville.

A contract was filed with the county recorder in San Bernardino, recently, under the terms of which W. E. Pedley, of Riverside, agreed to construct a conduit from the intake of the Whitewater Reservoir and Power Company to the proposed power plant at San Geronio canyon for \$66,750. Under the terms of the contract the flumeway is to be completed by October, 1910. According to the terms of agreement Mr. Pedley is to accept lands owned by the company at the east end of Ellsinore lake, at San Jacinto, in payment of the flumeway, or is to wait until the corporation sells these lands and take the proceeds. The company has 1,200 acres near San Jacinto lake and 750 acres at the east end of Lake Ellsinore. The rights now controlled by the Whitewater Reservoir and Power Company were originally secured by Poole Bros. of Los Angeles. Mr. Pedley, in a recent interview, stated that the flume which he will construct will be five and one-half miles long. The water will be conveyed to Banning, where it will be used to irrigate land for which there is no present water supply.

W. N. Woodson, proprietor of the Maywood colony, of Corning, has installed a pumping plant to irrigate 140 acres of land.

Henry Hazelbush has recently installed a pumping plant to irrigate his peach orchard near the town of Biggs.

Work on the government irrigation project at Orland, under direction of Engineer W. W. Schlacht, is progressing rapidly. The East Park reservoir dam is completed to an elevation of sixty-six feet above the stream level, and the dam will probably be completed by July 1st of this year. The government is at present furnishing water for irrigation for over 1,000 acres of land near Orland. This water is taken from the flood waters of Stony Creek and is furnished to water users at a nominal rate per acre.

W. A. Durbow, of Oroville, has taken a contract to build twenty-three miles of ditch in Lassen county. The contract was let by the Madeline Meadows Land and Irrigation Company. The water will be obtained from Tule lake. There are 40,000 acres of land open to settlement and more of it will be brought under irrigation. Under the contract the work is to be finished by April, 1911.

H. D. Graynor, of Redding, has filed on 125,000 inches of water in the Sacramento valley near Iron canyon. This is the largest filing of the year, and is thought to foreshadow an extensive irrigation project.

The Balfour, Guthrie Investment Company has purchased 12,000 acres of land near Stockton known as the Marsh ranch, located in the Byron section, the purchase price being \$650,000. It is reported that the company will install an irrigation system and sell the land in small tracts.

The Vernalis Farming Company, composed of F. E. Densmore, A. G. Stalder, Fred Stalder, Charles Stalder and Jack McGregor, of Riverside, has let the contract for the construction of 5,000 feet of 18-inch pipe for irrigation purposes. The gentlemen own 27,000 acres of land in Stanislaus county. Water will be pumped from the San Joaquin river.

The Sacramento Valley Irrigation Company has purchased 7,000 acres of land near St. John. It is also reported that the company has purchased the Finnell land

near Corning for \$500,000, but this report has not been verified.

The Pacific Farm Company, of Los Angeles, is the defendant in an action begun against it by T. G. Schulze and Grace Schulze. The plaintiffs allege they agreed to buy four lots from the company in King's county on condition that they would secure water for irrigation for \$8,000 in four installments. They claim that they paid \$2,000 and that the company failed to furnish water as contracted for, resulting in their crops being a total loss. They ask judgment for \$4,472, and reformation of the contract.

W. B. Reynolds, a well known fruit grower southwest of Yuba City, has installed a pumping plant with which to irrigate his orchard.

A special bond election was held in the southeastern part of San Joaquin county recently to give the directors authority to issue bonds to the amount of \$35,000 to pay the engineers' expenses and preliminary costs of the first work of the district. A dam will be constructed on the Stanislaus river. This district will embrace 71,000 acres of land.

Residents of Inyo county are interested in the formation of an irrigation district. In discussing it at a meeting held recently Mr. S. E. Vermilyea expressed the opinion that systematizing the water management of the valley under an irrigation district would treble land values within five years. An irrigation district would handle drainage questions as well as additional irrigation or storage and thus reclaim much land which is now over watered.

In order to protect the south San Joaquin Irrigation District against contractors who may band together and submit exorbitant bids, a corporation known as the San Joaquin Development Association was formed at Stockton recently and articles of incorporation were filed with the county clerk. The corporation is a non-profit one and was organized with the sanction of the Irrigation Bureau. It has a capital stock of \$10,000. The new corporation will aid in selling the \$175,000 bonds recently voted by the district. The directors of the development association are: M. A. Bertheau, A. L. Cowell, George W. Tatterson, Louis S. Wetmore and John D. Maxey.

On the Orland irrigation project eighty-nine applications for temporary water rental service for 1910 have been received, covering an area of 530 acres. It is anticipated that 1,200 acres will be irrigated from Stony Creek up to July 15. Water was turned into the south canal on April 7 and since that time the head has been gradually increased to 35 second feet. The East Park Dam has been completed to a height of 66 feet above the level of the stream. Ninety-eight concrete structures were built on the distribution system during April and work commenced on the seven inverted siphons under the Southern Pacific Railroad, for carrying the water across the railroad in the several ditches.

COLORADO.

The Bent County Reservoir Company, with holdings thirty miles southwest of Lamar, has let the contract for the construction of its irrigation system, at a cost of \$600,000. This work is to be completed by June 1, 1911. Water will be taken from Rule Creek to irrigate 20,000 acres of land.

Maps for the reservoir and ditches of an irrigation project in the vicinity of Abeyte have been filed at Trinidad. This project will reclaim 3,000 acres of land, with water taken from Rito Seco creek. The estimated cost of the project is \$75,000.

Construction of ditches and reservoirs in the Granada and Holly irrigation district has begun. Under this project, known as the Granada-Holly project, 40,000 acres of land will be reclaimed. It is proposed to enlarge the present Colorado-Kansas ditch, from its headgate to a point south of Lamar, and from this point a new ditch will be constructed, which will have a capacity of 818 cubic feet of water per second. A reservoir, located in Rule creek, is a part of the water system. The water from the reservoir is emptied into the Arkansas river, and is carried in this river for eleven miles, where it is taken out of the river at the Colorado and Kansas dam. In addition to the water taken from Rule creek, water is also to be taken from the Purgatoire

river. The Granada-Holly district was organized in January of this year. W. A. Merrill of Lamar is president. The total bond of the district will be \$1,250,000.

Plats of the Calahan reservoir No. 2 in the Fountain Valley, near Colorado Springs, have been filed with the county clerk, by A. P. Calahan. The proposed reservoir will be filled from the overflow of Fountain creek.

Water was turned on in the Orchard Mesa ditch near Grand Junction on May 27, to water 10,000 acres of fruit land. Water is taken from the Grand river and is brought into the pumping station near Palisade, and from there lifted to the land. The cost of the system is approximately \$1,000,000.

Secretary Tobin, of the Water Users Association, of the Western Slope, has issued a call for a special meeting of the stockholders of the Uncompahgre Valley Water Users Association, to be held in Olathe, June 30th, for the purpose of taking action on the purchase, by the association, of the Garnet ditch and all other ditch companies of the valley which have, up to that time, reached an agreement on a proposition for transferring their ditches to the association. Supervisor Engineer Walter has refused to recommend to the Interior Department the purchase of ditches where the price exceeds the estimate made on them by the reclamation engineer, without an affirmative vote on the part of the Water Users Association.

State Engineer Comstock has rendered a decision to the effect that a water right exists and has force for the beneficial use at the time when it might be used, and that it does not entitle the owner to store water after he has waived the use of it on the time or times when he might have used it. This decision grew out of the act of the Beaver Creek Irrigation Company, in turning into their reservoir water which might have been used for irrigation, but was stored instead. The company bought a large number of water rights, many of them being very old priorities. The decision rendered by Engineer Comstock affects almost every irrigation district in the state of Colorado.

A plat has been filed with the county clerk at Fort Collins for F. W. Bowen, of Chicago, for a reservoir site nine miles in length, at a cost of \$1,250,000. Part of the proposed site lies in the state of Wyoming and part in Colorado, the purpose being to impound the water of the Laramie river. The description covers some of the land already filed upon by the Laramie-Poudre Reservoir & Irrigation Company. It is intimated that this filing is a plan on the part of Wyoming parties to fight the efforts of the Laramie-Poudre Company to use the water of the Laramie river. The officers of the latter company have expressed the opinion that an effort to block their operations will fail.

J. A. Hayes, Irving Howbert, H. McGarry, J. T. Miliken and L. L. Aitken, of Colorado Springs, together with Denver capitalists, are planning to reclaim thousands of acres near Manitou Junction. The Western Reclamation Company has been organized for this purpose. By means of submerged dams, open cuts or sumps, the water of subterranean streams will be utilized in bringing under cultivation a vast area of what is now semi-arid land. The holdings of the East Colorado Springs Land Company, comprising 11,000 acres, will probably be the first to be brought under cultivation by the new system.

At a special meeting of the stockholders of the Fort Lyons Canal Company at Las Animas, a decision was reached authorizing a bond issue to the amount of \$675,000, to take up the former bond issue of \$250,000 and to make improvements on and finish the present canal and reservoir system. Permanent headquarters of the company have been established at Las Animas. The new reservoir on Horse creek, which has a capacity of 26,000 acre feet, has just been completed, and the reservoir on Adobe creek, having a capacity of 90,000 acre feet, is almost finished. The main canal of the system is 113 miles long. The system irrigates about 75,000 acres of land.

Residents of Phillips county have organized an irrigation district, to connect with the "Narrows" project near Fort Morgan. At a recent meeting, held at Holyoke, officers were elected as follows: S. S. Worley, president; W. G. Helland and O. C. Zingg, vice-presidents; Roy

Howser, secretary; G. L. King, R. G. McKibbin, Oba Canaday, Burl Osborn and A. P. Cronk, directors.

The Bent County Reservoir & Canal Company of Las Animas have let the contract for the construction of their irrigation system to the Kaw Construction Company of Kansas City, Mo. Water will be taken from Rule and Muddy creeks to irrigate 20,000 acres of land. About twenty-five miles of canal will be built. The system is to be finished in the spring of 1911.

J. C. Teller has withdrawn from sale the land known as the Pueblo Gardens. Mr. Teller will convert 2,000 acres of this land into an experimental farm, and by this method will demonstrate the productiveness of the land. A dam for irrigation purposes is being rushed to completion.

It is reported that C. C. & J. G. Magenheimer, representatives of the Woodland Company, of Chicago, are planning to take over the Udlock Power and Irrigation proposition in the Plateau Valley, and that as soon as the work on the Orchard Mesa ditch is completed, will commence work on a great irrigation project which will cost several millions of dollars.

Bulkley Wells of Telluride, J. P. Schley and F. M. McPherson, of Colorado Springs, have submitted a proposition to the State Land Board asking the temporary withdrawal of 160,000 acres of land in Montrose county, which they wish to reclaim by irrigation under the Carey Act. It is proposed to take 600 feet of water from the San Miguel river and carry it to the land.

A large number of Germans from Lincoln, Neb., have purchased land in the Denver-Greeley Valley Irrigation district and will colonize a large tract. They are all well-to-do farmers and thoroughly understand the cultivation of sugar beets.

Engineer Pease of the Reclamation Service has announced that water will be turned through the Gunnison Tunnel on July 1.

At a recent meeting of the farmers living in the Otero irrigation district, it was voted to issue \$150,000 additional bonds to be expended in ditch and reservoir improvements along the Otero canal system.

"Larry" Finch, Walter P. Crose, both of Montrose, together with Denver and Fort Morgan capitalists, are planning an irrigation project which will reclaim approximately 30,000 acres of land. The company has incorporated under the name of the Horsefly Irrigation, Power & Development Company. Surveys have been made and waters from Horsefly creek have been filed upon. The lands embraced in this project are situated near Montrose.

The water users of the South Palisade Heights Irrigation District have made a contract with John R. Gordon of Pueblo to install a gas producer plant, for the purpose of raising water from the Grand river to irrigate their land, located south of the Orchard Mesa project. The amount of land to be irrigated is 700 acres. The cost of construction of this plant is approximately \$86,000, which guarantees the delivery of water to the highest point of the land. This amount does not include the building of the main ditch, which will be about a mile and a half long. The cost of maintenance, it is claimed, will be about \$10.00 per acre.

E. B. Haver, of Pueblo, together with a group of capitalists of that city, has purchased 5,000 acres of state land, twenty miles east of Pueblo, and south of Boone, and will irrigate it by an extension of the Welton ditch. Additional water rights have been secured from the Huerfano river underflow, and other sources. Over \$50,000 was paid the state for the land purchased, and a much larger sum will be expended in the construction of mains and laterals for the irrigation system.

Surveyors are at work on the line for the proposed Havermyer irrigation canal, which will water several thousand acres adjoining the town of Grand Valley. Work will be started this month.

Halligan dam, on the north fork of the Cache la Poudre river, forty miles northwest of Fort Collins, is completed, and water turned on. This dam is part of the North Poudre Irrigation Company's system and cost more than \$200,000. The capacity of the reservoir created by the dam is 270,000,000 cubic feet, and will water 8,000 acres.

A preliminary injunction, restraining the American

Advertisers should not fail to note the significance of the letter as presented in cut form below. It is but a corroborating proof of the statement often repeated by the publisher of the IRRIGATION AGE—that its circulation extends to all parts of the west, and that gratifying results are to be obtained by advertising matter placed in the columns of this journal.

EIGHTEENTH NATIONAL IRRIGATION CONGRESS

SEPTEMBER 26 TO 30, 1910

PUEBLO, COLORADO March 31st, 1910.

My Dear Mr. Anderson:-

The Board of Control of the Eighteenth National Irrigation Congress, Pueblo, Colorado, September 26th-30th, 1910, realizes the fact that IRRIGATION AGE is the foremost publication in irrigation and development work in the country, and one of the leading journals in the West in every particular. The Board of Control appreciates the work of IRRIGATION AGE in the past twenty-five years, and the great service it has rendered in the cause of irrigation. The publication itself, and you as an individual, who helped organize the National Irrigation Congress, and served it so ably as secretary, certainly have a fixed status with respect to the Congress, which has now entered such a large and important field in this country.

The Board of Control realizes that in years past a great attention has been attracted to the congress for that year by means of unusual efforts made by your publication, and particularly by some special editions of IRRIGATION AGE. These have forced attention upon the Congress, its purpose and what it expected to do by reason of the high character of these editions, and the splendid enthusiasm with which you entered into the work.

It is, therefore, with pleasure, that the Board of Control recognizes IRRIGATION AGE as the official publication, and expresses the hope that it will see fit this year, as in former years, to put out one or more special editions, inviting attention to the work of the National Irrigation Congress, and to the Eighteenth sessions to be held in the city of Pueblo, September 26-30, 1910.

Very respectfully yours,

(SIGNED) P. J. DUGAN, CHAIRMAN.

(SIGNED) R. H. FAXON, SECRETARY.

BOARD OF CONTROL

EIGHTEENTH NATIONAL IRRIGATION CONGRESS

Mr. D. H. Anderson,
Publisher, IRRIGATION AGE,
Chicago, Illinois.

With the full co-operation and confidence of the members of the Board of Control of the Eighteenth National Irrigation Congress, the AGE is planning three mammoth editions for July, August and September of this year. These editions are calculated to excite great interest in an institution that has already gained the confidence of the irrigation farmer—the Eighteenth Session of the National Irrigation Congress.

Commercial organizations through the West have already placed large advance orders for these numbers of the AGE, advising by letter while placing their orders that they will assist in its circulation in order to boom the congress. In other legitimate ways the regular circulation of the AGE will be increased by nearly fifty per cent during these three months.

We court investigation of the results attained by advertising matter in this journal and we respectfully submit, to every advertiser who wishes to encourage trade from this new, rapidly developing field, that the three issues as named will reach a larger percentage of irrigation farmers than any other publication entered at the post-office as second class matter. This statement is directed to bona fide advertisers who seek a broader sales field.

MONTE VISTA, SAN LUIS

The Newest SUGAR TOWN on the Map

We believe Monte Vista offers the greatest opportunities to the settler, business man, and investor to be found in the West today.

We are taking all this space to tell you about it.

MONTE VISTA—population 3,000—has 100 automobiles, **one touring car to every thirty persons in the town.**

Does this mean prosperity?

Does it mean anything to you?



CITY PARK IN MONTE VISTA

THE NEW SUNNYSIDE ADDITION to Monte Vista is attracting investors from all over the country. Streets of uniform grade and parking—cement sidewalks—water and trees—all within four squares of the principal business street of Monte Vista.

**WHEN A TOWN HAS A FUTURE IT IS BUILT OF STONE
and BRICK—THIS IS MONTE VISTA.**

46 homes building, and we expect at least 200 this year. Business Men, Settlers, Irrigationists, coming in on every train. **SUNNYSIDE** is the choicest and “growingest” town addition in the whole Golden West. Let us tell you more about the San Luis Valley, Monte Vista and Sunnyside.

THE MONTE VISTA SECURITIES COMPANY

VALLEY, COLORADO

MONTE VISTA is in the center of the largest continuous body of irrigated land in America—500,000 acres under cultivation last year—2,000,000 acres can be made available, and hence we must grow.

MONTE VISTA is not only a city of homes, but the city of the great San Luis Valley. Its population would double normally in the next few years, because of the tremendous prosperity attending the surrounding irrigation country, but it will treble and quadruple because of the new sugar mill and new railway about to be built.

COLORADO

Colorado produced two million dollars more of farm products last year than its total mineral output.

It has the most perfect climate in the world. Because of its altitude and its continuous golden sunshine, invalids are made strong men, and take their places in the ranks of the hardy fighters of the West.

Colorado stands for health, wealth, and happiness.

The Irrigation Congress meets at Pueblo (the gateway to the San Luis Valley) Sept. 26-30th of this year. Already great newspapers of the East have their scouts out all over Colorado lining up for this great gathering, and publishing hundreds of columns about the golden state. Magazines will devote page after page to Colorado's wonderful scenery, to its attractiveness as a living place, and finally to its ever increasing prosperity from its millions of irrigated acres. Where once the desert ruled, waves rippling fields of grain, and the sweet scent of the field pea blossoms perfumes the air.

Colorado, although as big as two or three ordinary states, has only 700,000 people. The OPPORTUNITY for you is here. Will you BE ONE OF US?

SAN LUIS VALLEY

The San Luis Valley is in south central Colorado. Leaving Denver or Pueblo, in a night one crosses a range of mountains and finds this vast valley, level as a floor, 150 miles long and 65 miles wide. The magnificent sweep of the mountain range, with its snow capped peaks, completely encircles this beautiful valley, and a great writer has tried to prove this the original Garden of Eden. Forty-three streams and rivulets bursting from the breast of the mountain range water this terrestrial paradise.

All kinds of crops peculiar to Colorado and noted all over the country, are grown. The newcomer is astounded at the beautiful homes, in many cases paid for by the farm produce of a single year.

There is still government land here to be obtained, or one can acquire tracts of low-priced deeded land. The land of the San Luis Valley has not yet been cut into small tracts, nor intensive farming begun.

Think what the new sugar factory means to this valley. Write and we will tell you about it.

MONTE VISTA and "Sunnyside Addition"

"Sunnyside" is an addition to Monte Vista, the city of the San Luis Valley, building in the only direction the town may logically grow.

A representative of the Irrigation Age after careful investigation vouches for the fact that sugar beets, planted in the San Luis Valley this year, show up as well as in old sugar sections in Colorado, and that the sugar factory at Monte Vista and the new railway to run north from Monte Vista will handle the output from 6,000 acres of beets already contracted.

The table given below shows the increase in Colorado towns where sugar factories are located. We will furnish verification of these figures on request.

Town	Factory Built	Population Before	Population Now
Sugar City	1900	None	1500
Rocky Ford	1900	1500	5000
Loveland	1900	1500	6000
Greeley	1902	3500	12000
Windsor	1903	700	2000
Ft. Collins	1904	5500	12000
Holly	1905	500	1200
Ft. Morgan	1906	1500	5500
Swink	1906	3	400
Sterling	1906	1500	2500
Brush	1907	800	1500

THE OPPORTUNITY in the West is at the beginning. Write us now.

The Monte Vista Securities Company,
Monte Vista, Colorado

IF YOU ARE AN IRRIGATIONIST already, you will know what this means. If you are not, we will tell you it means OPPORTUNITY.

Get into a new country where prices are still way down.

Send us your name and address and we will send you FREE our beautifully illustrated Souvenir Booklet, telling you more about Monte Vista and Sunnyside.

The Monte Vista Securities Company

Monte Vista, Colorado

Trust & Savings Bank, of Chicago, trustee, and F. H. Jones, trustee, from delivering \$46,000 worth of bonds of the San Luis Valley Irrigation, Land and Power Company to the order of J. H. Avery, was asked in a bill filed by Frank W. Porterfield of Atlanta, Iowa, in the superior court recently. Mr. Porterfield states that he was chosen president of the company when it was organized in March, 1909, and that J. H. Avery is only "pretending" to be president. Shortly after its organization the San Luis Valley Irrigation, Land & Power Company deeded all of its holdings to a new company, organized under the same name; the new company giving a trust deed to the American Trust & Savings Bank for \$750,000 worth of bonds. Mr. Avery is asking \$46,000 worth of these bonds, and Porterfield says the delivery would result in irreparable injury to himself and the stockholders of the concern.

A large municipal irrigation district has just been formed in La Plata county, near Durango, and the Board of Directors has been elected. The purpose is to secure storage waters from the Florida river. The bonds have not yet been voted on, but probably will be in July. Eastern capital is now figuring with the directors. It is the intention to irrigate a total of 25,000 acres.

A map has been filed at Greeley, by Theodore D. Jones, a Denver engineer, for a large reservoir in Weld county, which will be known as Farmers Reservoir No. 3. The reservoir will irrigate a large area of land in the western part of that county. The estimated cost of this project is \$1,500,000. Water will be taken from St. Vrain creek, Boulder creek, the South Platte river, Little Thompson creek, Big Thompson creek and the Cache la Poudre creek.

Water has been turned into the intake ditch of the Model Land and Irrigation Company's project. The dam is not quite completed and the water is being used to irrigate land near Hoehne. When the dam is completed it will reclaim 20,000 acres of land near Earle.

Articles of incorporation have been filed by the Southern Colorado Reservoir & Irrigation Company, of Denver. The capital stock of the company is placed at \$1,000,000, with headquarters at Denver. The incorporators are David W. Brunton, Zeph C. Felt, Arthur Ponsford and Edwin S. Worrell, Jr.

The early surveys and plans of Greasewood Reservoir, thirty miles northeast of Greeley, are to be enlarged so that it will have a capacity of 3,484,800,000 cubic feet of water. The reservoir site is a natural one and is known as Greasewood Lake. Water will be taken from the Poudre river to irrigate 50,000 acres of land.

The Consolidated Construction Company has filed articles of incorporation, naming their capital stock at \$1,000,000. The main offices of the company will be in Denver. This company has absorbed the Boston-Colorado Power Company and the Park Irrigation & Water Company, each having a capital stock of \$200,000. The new company plans to irrigate 200,000 acres. The incorporators of the company are C. F. Underhill, president; Thos. E. Bartlett, vice-president, and C. S. Ripley, treasurer.

IDAHO.

The department of the interior and the president of the United States have approved the maps, and the secretary of the interior has executed the contract with the state of Idaho for the segregation of about 8,000 acres under the provisions of the Carey Act. The land will be irrigated under the reservoir and canal system by William Owsley, a resident of Butte, Montana. The land covered by this project will be irrigated by water taken from Mudd lake.

The contract for the construction of the big Crane creek irrigation project which will cover 22,000 acres of land adjoining Weiser has been let to the Slick Construction Company of Boise. It has proposed to construct a dam, ditch and flumes. The dam will be located sixteen miles from Weiser and will make a reservoir about four miles wide and six miles long. The contract price is about \$950,000.

A project embracing 6,000 acres of orchard lands on the Council mesa in Payette Valley, is being financed by a syndicate of London, eastern and western capitalists, who will spend \$3,000,000. Those interested in the

project are E. M. Hunter, representing Chicago and Des Moines bankers and railroad officials; S. F. Champien representing London, Chicago and San Francisco interests; Colonel E. M. Heighe, president of the Pacific & Idaho Railway Company. It is announced that the 6,000 acres will be planted to fruit trees and is to be operated as a commercial proposition, the owners dealing directly with the merchants in eastern and western points and also developing a market in London.

The Sunnyside Orchard Company has installed a pumping plant in the Snake river for the purpose of irrigating 1,000 acres of orchard land. The pumping station contains two 40-horsepower engines and two ten-inch centrifugal pumps, each of which will pump 350 miner's inches. The water is lifted seventeen to twenty-eight feet, according to the stage of the river, into a large cement distributing station. Three main galvanized pipe laterals extending from the distributing station lead across the tract in three directions.

Active work has begun on the Fish Creek irrigation project and the contractor is under a bond to finish the new dam in time for next year's crops. Under these laterals and above them are some 10,000 acres still open to homesteaders.

The Secretary of the Interior is asking for proposals for the enlargement of the main south side canal, Payette-Boise irrigation project. This work involves the excavation of about 342,000 cubic yards of material, and the completion of the contract is set for April 1, 1912. The bids will be opened at the office of the Reclamation Service, Boise, Idaho, on July 8, 1910, at which office specifications are available.

MONTANA.

A new irrigation enterprise is being formed on Choteau Coulee, northeast of Chinook.

J. A. Frazer of Terry is constructing an irrigation system on his farm near that town. Two miles of irrigation ditches have been constructed for him by E. Roberts of Miles City.

It is reported that a Chicago syndicate has purchased the interests of the Ames Realty Company of St. Louis, in the Dearborn-Carey land act project in Lewis and Clark county. The new owners propose to spend \$450,000 to reclaim 36,000 acres of land.

Work of rebuilding the Hauser lake dam twenty miles from Helena on the Missouri river has been temporarily suspended and will not be resumed until after the season of high water in July. This dam is being constructed by the Stone & Webster Engineering Corporation. Work has progressed to such an extent that the water will do no damage to the permanent structure.

The interior department has designated, under the enlarged homestead act, approximately 400,000 acres of land in Montana as not susceptible of irrigation from any known source of water supply. This makes the total area so designated in Montana to date 29,590,000 acres.

A petition has been filed in the district court asking for the organization of a district to be known as the Mill Creek Irrigation District. The petition states that the movement is for the formation of a district to use the waters from Mill creek and its tributaries for irrigation purposes. It has planned to construct reservoirs and dams above the land to be irrigated. Mill creek flows from the canyon in a northeasterly direction and empties in the Bitter Root river a short distance from Woodside. Several thousand acres of land are embraced in the district to be organized.

NEW MEXICO.

Contractors have started work on the foundation of the dam for the million dollar Oscura project in Lincoln county.

A party of Willard business men visited Belen recently and consulted with the owners of the Willard Townsite Company in regard to organizing an irrigation company on the same plan as the one now doing work in Portales, New Mexico. This is a pumping proposition and much interest is manifested in the outcome.

Commissioners of San Miguel county have been petitioned for the formation of what will be known as the Las Vegas Irrigation district. The land embraced in this district lies between the Sanguijuela reservoir and Romeroville, between the line of the Camfield ditch and the city

of Las Vegas. A portion of the town of Las Vegas is also included in the district.

Applications and maps have been filed with the territorial engineer for an immense irrigation project on the Canadian river. Bonds will be issued to build the irrigation system. J. B. Stewart, of the United States geological department, visited Logan recently and took measurements of the Canadian river, and expresses the opinion that there is sufficient water to irrigate 75,000 acres of land. The main dam for this project will form the largest artificial body of water in the world, making a lake over forty miles long and sufficient to cover 3,125 square miles of ground at a depth of one foot. The irrigating capacity of the reservoir will be 180,000 acres.

Holmer W. Scofield of Alamagordo has filed an application with Territorial Engineer Sullivan for water rights on Tularosa and Tecolote canyons to irrigate 400 acres of land.

The Carlsbad project in Eddy county has made its first payment to the United States government for money expended in constructing the irrigation system. The water users have met their dues with very few exceptions. Considerable new land is being brought under cultivation this season and practically the whole 20,000 acres under the project will be using water before the end of the 1910 season.

The Taos Valley Company's irrigation canal is being pushed rapidly to completion. Mr. J. B. Manby, of Trinidad, Colorado, has the contract.

The application of E. F. Hardwich of Roswell for water from Bogs on the Pecos river to irrigate 1,360 acres has been approved by Territorial Engineer Sullivan.

J. J. Jacobsen of Deming has recently installed two irrigation pumps on his ranch near that town.

L. F. Hutchinson of Fruitland has applied for water out of arroyos on the meadows in San Juan county, to irrigate 320 acres.

OREGON.

F. J. Blakeley of Roseburg plans to build a storage reservoir at the head of Applegate river, to irrigate the valley in the vicinity of Grant's Pass. Petitions are being circulated and signed for the formation of an irrigation project. It is claimed by Mr. Blakeley and his associates that sufficient water can be secured at the head of the Applegate river to cover 40,000 acres of land. Eastern capital is said to be backing Mr. Blakeley.

The Oregon & Western Colonization Company, with a capital stock of \$12,000,000, have filed articles of incorporation. The company's headquarters will be in St. Paul, Minnesota. W. P. Davidson, a well known land operator of that city, has been made president. Other officers of the company are: John Burchard, vice-president; O. A. Robertson, treasurer; Joseph C. Wood, secretary. This company has bought 600,000 acres of land in central Oregon. The immense tract was transferred entire, and represents a belt about 400 miles in length and of varying width. Of this total, 660,000 acres is agricultural land much of which will be placed under irrigation. The remaining 140,000 acres is heavily timbered. The land included in the purchase was originally granted to the state of Oregon in 1865 by the United States government and was in turn granted by the state to the Willamette Valley and Cascade Mountain Road Corporation, formed for the purpose of constructing a highway across the state.

The lands embraced in the abandoned Upper Project near Klamath Falls may now be irrigated. At a recent meeting of the land owners which was attended by officials of the reclamation service, it was shown that land owners are willing to sign up for government irrigation, even if the cost should approximate \$70 per acre. Parties who are interested in the project are circulating petitions.

Land owners on Rock Creek near Condon are preparing to irrigate 15,000 acres of land by a co-operative project, taking water from a reservoir at Devil's Gate. Bonds will be issued to raise the necessary funds.

It is reported that work on the Horsefly Irrigation District near Bonanza, which was stopped by the government because of dissension among the people interested and their refusal at one time to pay the increased cost of getting water to their land, will be resumed shortly.

A mass meeting was held recently and a plan outlined for inducing the government to again take up this part of the project and complete it. Chief Engineer Patch promised to interest the government to take some action if the owners would sign contracts at an estimated cost of from \$50 to \$65 an acre. Engineer Patch stated that it would be necessary to have 20,000 acres signed for before the government would act. The Horsefly Irrigation District is a part of the Klamath project. The people in this district have asked that the Horsefly project be separated from the rest of the Klamath project so that the land owners who will be benefited from the Horsefly dam will only have to pay for their own project and not help bear the expense of the rest of the work. They have a new form of contract which they will present to the government, which calls for the express agreement between the land owners and the government that if they sign up and the government begins the work of completing the project the estimated money required to build the reservoir and complete the system, be set aside within the space of one year from the time of the signing of the contract. If the government enters into the proposed contract with the land owners to start the Horsefly project, they believe they will then have some assurance of its fulfillment.

The state of Oregon has served notice on the Deschutes Irrigation & Power Company that unless steps are taken to complete the segregations of land controlled by that company and to get water on all the tracts, the state will exercise its right and order the land sold at public auction. The receiver has proceeded rapidly with the report of the condition of the company and under the law it will be at least five months before the state can sell any of the land. This will give the receiver time to arrange his affairs and resume work on the construction of irrigation ditches for the completion of the contract of the company with the state.

C. S. Walters, who owns 140 acres of fruit land in the vicinity of West Woodburn, is planning to establish an irrigation system on his ranch. Water will be secured from wells and will be pumped by means of gasoline engines.

The Middle Fork Irrigation Company has filed on Lava Bed spring in the Upper Hood River valley and will divert its water for irrigation purposes. The Lava Bed Spring has the largest flow of any in the valley and the water is of extreme purity and beyond possible pollution. The Middle Fork company filed on the water last fall; it kept the matter a secret; constructed its ditches and had water running onto the land before it became known that any one had obtained water rights. The Middle Fork ditch covers an area of 5,500 acres in the Upper valley lying between the east and middle forks of Hood river.

On May 16, Charles M. Redfield, receiver of the Deschutes Irrigation and Power Company, filed a report of his receivership, showing the condition of the company. The report came as a result of the direction of the court and was made in connection with the suit of Frank R. Shinn and others against the power company. According to the report the receiver has received \$51,435.67 since taking charge of the company. He has expended \$3,570.85, and had on hand April 10, \$47,864.82.

Indications are that the greater part of the first unit of the Klamath irrigation project, embracing approximately 30,908 acres will be fully farmed and irrigated this season. Water was turned into the main canal on April 25 and the delivery of water to the farmers was begun. Approximately 750 acre-feet of water have been turned out of Clear Lake reservoir for the benefit of the so-called swamp lands at the upper end of Langells Valley.

UTAH.

B. F. Walling & Company, of Chicago and St. Paul, are interested in 76,000 acres of land in Beaver county owned by the Beaver Irrigation and Power Company. The company is organized under the laws of Idaho and the land to be reclaimed is located in Beaver county, Utah. At the annual meeting of the stockholders, which was held at Boise, Idaho, the following officers were elected: A. B. Lewis, president; T. C. Foley, vice-president; Edward Kreihheil, treasurer, and A. R. Lewis, secretary.

The tunnel of the Strawberry Irrigation project has now a total length of 7,000 feet, according to the report of J. L. Lytel, engineer in charge. There is a distance of 12,000 feet yet to be driven before the tunnel is completed. This work will probably take two and a half years more.

Chicago capitalists have secured a tract of land consisting of 164,000 acres in Washington county in the southwestern part of the state. This project is to be developed under the Carey Act and is known as the "Dixie land of Utah." Robert I. Fischer of Mendota, Ill., is heavily interested in the project. The company will build a railroad 140 miles long, contract for which has been let to McArthur Bros. of New York City.

The application of E. Warren Stees, made on April 6, 1910, for a tract of land near Woodside in Emery county along the Price river, has been approved by the general land office at Washington. This project embraces 4,959 acres, and is to be irrigated under the reservoir canal system. It is proposed to construct a reservoir near the Price river and extend the water through a canal to the land.

F. C. Grayden of St. George has filed six separate applications with State Engineer Caleb Tanner to use public waters in Iron county for irrigation. He asked for water from Rush lake, Little Salt lake, Center creek, Red creek and Summit creek. He intends to irrigate 21,200 acres of land.

The Geyser reservoir on the La Sal, from which several thousand acres of land in Paradox valley were to be irrigated this year, broke recently and the greater part of the dam was washed out. The reservoir is located at the head of Rock creek. It is estimated that at least 2,500 acres of valuable farming land will be without water this year. The flood was caused by a defective spillway. The pipe used for the purpose was set in dirt instead of concrete. The dam was also narrower at the top by twenty feet than the plans approved by the state engineer called for. A representative of the state engineer's office inspected the reservoir some time in March and disapproved the construction of the dam and forbade the company to fill the reservoir with water.

James S. Emmett, of Annabella, has made application to State Engineer Tanner for the use of waters of Norton creek in Sevier county to irrigate 160 acres of land.

The Secretary of the Interior has awarded contract to the Union Portland Cement Company of Ogden for furnishing 9,000 barrels of Portland cement for use in connection with the Strawberry Valley irrigation project, Utah.

WASHINGTON.

Owners of 20,000 acres watered by Wenas creek, near North Yakima, met recently and protested against an order of the Department of the Interior, allowing the storing up of the flood waters of Wenas creek for the use of a private irrigation company. Parties having prior water appropriations or riparian rights claim that under conditions of ordinary snowfall there are no flood waters to be stored, and that the purchase of land under an irrigation scheme which would have water to supply only in time of unusual snowfall would be working hardship and privation upon innocent buyers.

A large force of men are at work on an irrigation project sixteen miles northeast of Husum, in what is known as the Camas Prairie county. The waters of the Klickitat river will be diverted, and 20,000 acres of land brought under cultivation. The approximate cost of the project is \$2,000,000.

From 500 to 2,000 acres of semi-arid land near Starbuck will be placed under irrigation, according to plans of President Bryan, of the State College of Washington, and others.

Work on the Tieton reclamation project has been completed, and water was turned through the tunnel into the canal on June 8. This water is for 8,000 acres of the first unit of the project by which the government has reclaimed 35,000 acres.

Engineer Anderson has made the preliminary survey of a high line ditch, which will water 220,000 acres in Kittitas and Yakima counties, and furnish the power to water the Benton project of 100,000 acres. The plan is to construct a high line ditch, which will have a big drop

east of North Yakima. It is proposed to build a power house and there generate power to lift water from the Columbia river below Priest Rapids for the Benton project. Under this plan the water of the Yakima river intended for the Benton project will be saved for other projects.

The Chelan & Okanogan Water Users' Association has dissolved, and in its stead the Methow-Okanogan Water Users' Association has been organized. This association will proceed with the irrigation project, watering approximately 20,000 acres on Brewster and Tarheel flats near Malott.

United States Senator Wesley L. Jones has advised the Irrigation Committee of the Spokane Chamber of Commerce that the government high line project in the Kittitas district, covering 62,000 acres in central Washington, will cost \$3,937,000. The cost of the diversion works is estimated at \$3,100,000 and the storage system to be about \$837,000.

The Hanford Irrigation and Power Company, having an irrigation project near Priest Rapids, has disposed of its holding to some eastern corporation. Plans of the company, which contemplate the expenditure of \$3,000,000, include the enlargement of the present power plant and a big reduction of the price of land and water charges and the irrigation of all lands under the 287-foot level.

The state board of land commissioners have agreed that R. G. Strahorn's Columbia Valley Reclamation Company must pay the state \$25,000 for shore lands of the Columbia river at Priest Rapids. This company must also pay from \$25 to \$100 per acre for such lands in that vicinity as are desired by the company for rights-of-way and for storage purposes. The reclamation company will install a power plant near Priest Rapids with a capacity of 40,000 to 50,000 horse power, to elevate the water for irrigation.

Plans have been made to construct a dyking system to reclaim 3,000 acres of waste land near Mount Solo. This system will be conducted on a co-operative plan by a number of Finlanders who own large areas of overflow lands in Cowlitz county. The estimated cost of the improvement is \$50,000.

The Secretary of the Interior has rejected as unsatisfactory all bids received for the excavation of forty miles of sublaterals on the Cowiche-Yakima branch of the Tieton unit, Yakima irrigation project, and has authorized the Reclamation Service to undertake this work by force account.

WYOMING.

Joy Norton of Chicago, president of the Wyoming Central Irrigation Company, and nine other officials and stockholders of the company, visited Cheyenne recently and conferred with Governor Brooks, Clarence T. Johnson, state engineer, and members of the state land board relative to the company's state grant of the water available for the reclamation of lands in the ceded portion of the Wind River reservation. This meeting was in connection with the state's demand that the company utilize this water right or make way for a concern that will.

The Routt County Development Company, which proposes to reclaim 50,000 acres with water from the Snake river and tributaries, has resumed work after a protracted shut down. This land lies on both sides of the Colorado-Wyoming line. Extensive plans for colonization have been taken up and it is expected that settlers will be on the ground during the present summer.

The Billings Sugar Beet Company has made arrangements to cultivate a tract of land containing about eighteen acres within the Powell Townsite, Shoshone irrigation project, during the present season. Their primary purpose is to demonstrate for the benefit of the settlers on the project several different methods of successfully growing sugar beets, alfalfa, and allied crops. These experiments will be carried on at no expense to the government other than the use of the land and the water and a few tools now in stock for which there will be no other requirements this season.

MISCELLANEOUS.

Russell Bros., southwest of Boise City, Okla., have installed a gas engine with which to irrigate. It is esti-

mated that the engine will raise over 300 barrels of water per day.

W. W. Blake, president of the Casa Grande Land, Power and Development Company of Casa Grande, Ariz., has purchased a "Keystone" drilling plant at a cost of \$4,000. This machine will be used in boring the system of wells situated near Casa Grande.

The Roosevelt dam in the Salt River irrigation project in Arizona has been completed. The reservoir has a capacity of 61,000,000,000 cubic feet. It is 280 feet high, 180 feet long on top and contains 326,000 cubic yards of masonry. The project will not be formally opened until fall. When completed this project will embrace 240,000 acres of land and will cost approximately \$8,640,000.

C. E. Hemperly and C. L. Hawley have installed pumps on their homesteads southeast of Mesa, Ariz., with which to irrigate their lands.

A temporary injunction has been granted by Judge Maxey of San Antonio, Tex., in the case of William P. Clarkson, trustee, vs. Samuel Velpe Briggs et al. The suit involves the use of the waters of the Pecos river for the irrigation of lands non-riparian to the river. The defendants are alleged to have been wrongfully diverting the ordinary and natural flow of the Pecos river. The application for injunction asked that the defendants be enjoined from diverting these waters, except in subordination of the plaintiff's prior rights to such waters as the riparian owner. The question involved in this suit is an important one and it will no doubt affect many of the irrigation companies now building vast systems of canals to carry water from various rivers far into the interior for irrigation purposes.

F. A. Hornbeck, land commissioner of the Kansas City, Mexico & Orient Railroad, has announced that the Imperial irrigation project on the company's line in Pecos county, Texas, will soon be completed. This project includes an irrigation lake two miles square and seventeen feet deep and sixty miles of main canals. Water will be delivered to the farmers in August. W. W. Follett, of El Paso, is in charge of the irrigation work. Over \$250,000 has been expended in building this irrigation system, which will reclaim about 25,000 acres of land.

At the annual meeting of the stockholders of the Santa Maria Irrigation Company, held at Brownsville, Texas, early in May, the following officers were elected: E. C. Forto, president; W. A. McNeil, vice-president; F. S. Champion, general manager and secretary; R. C. Bryant, second vice-president; R. H. Kern, Jr., treasurer. This irrigation plant is located near Santa Maria about thirty miles above Brownsville.

An irrigation plant will be installed at the Virginia Truck Experiment Station, Princess Anne county, Va. It is believed by the governing board that irrigation will prove an interesting subject for truck experiment and possibly show how the natural facilities of the truck sections may be advantageously supplemented.

The state board of irrigation met recently at Lincoln, Neb., and the application for water rights on Blue river was taken up. The board some time ago granted Morris Freshman and Henry Miller, both of Beatrice, a right to construct a dam on the Blue river between Beatrice and Holmesville. About two months after this privilege was given them, George Steinmeyer of Beatrice started proceedings in the district court at Beatrice to prove that the state land board has no right to grant power sites. If Mr. Steinmeyer wins his point it will mean the annulment of a large number of sites, developed and undeveloped, granted by the board of irrigation since the irrigation laws were enacted by the Nebraska legislature in 1895.

H. W. Fusselman, a farmer living near Trexlertown, Pa., has installed an irrigation system on his farm near that town. Mr. Fusselman had the system installed last year and the results were highly satisfactory. The government, hearing of this irrigation scheme, investigated and offered assistance in order to develop methods that would be of use to other agriculturists. The government has decided to send an agent to Mr. Fusselman's farm this year. He will lay it out in a scientific manner, and much interest is manifested in the outcome.

The Committee on Irrigation of the Chamber of Commerce, Rochester, N. Y., held a meeting recently and discussed the possibilities of irrigation and reclamation in

that vicinity. The plan most favored is the use of the new barge canal as the main ditch. In places where the soil is so dry as to be almost barren proper irrigation ditches could be run through the property and the required water drawn from the canal. Another meeting will be held soon to find a plant, secure the co-operation of the farmers and get them to undertake the work. The members of the committee are as follows: C. F. Garfield, chairman; Herman Russell, Kingman Robbins, D. B. Murphy, Granger Hollister, George W. Lynch, William C. Barry, Charles J. Brown, R. M. Searle, F. L. Lamson, H. L. Fairchild, Cogswell Bentley and Roland B. Woodward.

The Amargosa Land & Irrigation Company, having about 18,000 acres of land south of Goldfield, Nev., expects to receive title for the land from the government land office within the next few weeks. This will be the first appropriation under the Carey Act in the state of Nevada. The company has also made application for additional acreage, which in all will approximate 100,000 acres if sufficient water can be developed. The first section will be irrigated by pumping the surplus water from the Amargosa river. Water will be flowing upon the land within ninety days from the time actual work is begun upon the pumping plant.

Emil Howenstine of Huntington, Ind., is the first person to undertake an irrigation proposition in Indiana. Mr. Howenstine is a truck gardener, and for many years his gardens have suffered from drought. He has installed an engine of several horsepower and a pump which will lift water from the Wabash river to the top of the bank, from which the natural slope of the land will carry it over the lands. Mr. Howenstine will put his irrigation scheme into practice, first, in a six-acre field of strawberries, and if the plan proves successful he will extend it to another portion of his farm. Farmers and truck men of the country are watching his experiments with much interest.

Dr. W. S. Chaplin of Mercedes, Texas, has resigned as president of the American Rio Grande Land & Irrigation Company, and it is announced that Mr. W. E. Guy of St. Louis has been elected his successor.

The Stiles Business Club of Stiles, Texas, has taken under consideration a proposition to start an irrigation farm as an experiment.

A Chicago syndicate has recently purchased 1,000,000 acres of Louisiana swamp land on which the work of reclamation will soon commence. The property will be transferred to the United Irrigation & Rice Milling Company, and the syndicate will take \$1,000,000 in first mortgage bonds on the property of the company. The United Irrigation and Rice Company owns and operate a complete irrigation system of 143 miles of canals, sufficient to water 60,000 acres of land.

The Valley Reservoir & Canal Company, of Chapin, Texas, has awarded the contract for the construction of the first eight miles of canals for irrigating 100,000 acres of land in Hidalgo county.

Construction work on the canal of the irrigation system belonging to the Collegeport Canal Company, is practically completed, and it is expected that one part of the pumping plant, with a capacity to water 10,000 acres, will be installed in time to furnish water for the season's rice crop. The pumping site is located about ten miles below Bay City, Texas.

The Espejo ranch, comprising 18,600 acres of land, located in the Rio Grande valley, fifteen miles below Laredo, in Webb county, has been purchased by Frank Curtice Smith, V. A. Petty, J. Tom Williams and others of San Antonio, who will develop a large irrigation proposition. This property has a two-mile river frontage, and a small part of the ranch has been under irrigation for the past few years.

The Secretary of the Interior has instructed that preliminary work in connection with the Rio Grande irrigation project be begun at once. Actual construction of the foundation of Engel dam, the most important engineering feature of the project, will be begun by July 1, 1911. The Rio Grande project will embrace 180,000 acres of land lying between New Mexico, Texas and Mexico. The estimated cost of the project is \$9,000,000. The Engel dam, which will be made of rubble concrete, will be 265 feet high, and the length of the crest will be 1,400 feet.

Recent Legal Decisions on Irrigation and Related Rights

RIGHTS AS TO CHANGING POINTS OF DIVERSION, AND OF JUNIOR APPROPRIATORS.

The supreme court of Colorado says, in *Vogel vs. Minnesota Canal & Reservoir Co.*, 107 Pacific Reporter, 1108, that the right, in an owner of a water priority for irrigation, to change the point of diversion is not absolute is well settled. It is a qualified right, and its exercise is conditional upon the fact that such change will not injuriously affect the vested rights of others. Such has been the uniform holding of this court through an unbroken line of decisions, beginning with *Fuller vs. Swan River Co.*, 12 Colo. 12, down to the present time.

While it is true that the right to change the point of diversion is a property right, it is one which may not be exercised without limitation, or at all, except upon terms, where it appears that such change will impair the vested rights of others. No inflexible rule, applicable in all cases where such change is sought, can be laid down. The right to have the change made depends upon, and must be controlled by, the facts of each particular case.

It seemed manifest in this case that if certain priorities were diverted through certain ditches, as proposed, and used constantly through the irrigating season, as was intended, that, after the season of low water in each year set in, no water would remain in the stream for the use of any junior appropriator for any purpose, but on the contrary the stream would become dry. In the face of the showing that, for from fifteen to twenty years prior to the commencement of these proceedings, all junior appropriators of water on the stream had practically, at all times, been able to grow and mature crops, the result above suggested, which the proof showed was likely to occur, clearly established that such proposed change in the point of diversion would alter the conditions theretofore, and at the time junior appropriators secured their rights, existing on the stream, in such a way as to not only injuriously affect, but completely destroy, those rights.

Further, where one has the first priority on a stream, taking water out at the lowest point thereon, it does not follow that junior appropriators, up the stream, must at all times and under all conditions, let sufficient water remain therein to flow past their headgates to supply that priority. The senior appropriator may lawfully demand that he have at his headgate sufficient water to supply his present needs, and if that result be obtained through return waters after first use by junior appropriators up the stream, the senior appropriator has no just ground of complaint.

This court has often said, in substance, that a junior appropriator of water to a beneficial use has a vested right, as against his senior, in a continuation of the conditions on the stream as they existed at the time he made his appropriation. If this means anything, it is that when the junior appropriator makes his appropriation he acquires a vested right in the conditions then prevailing upon the stream, and surrounding the general method of use of water therefrom. He has a right to assume that these are fixed conditions and will so remain, at least without substantial change, unless it appears that a proposed change will not work harm to his vested rights.

RIGHTS OF OWNER OF LAND CONTAINING WATER-BEARING STRATUM AS AGAINST APPROPRIATORS, ESPECIALLY FOR USE BEYOND WATERSHED.

The supreme court of California says that the precise question raised in the case of *Miller vs. Bay City Water Co.*, 107 Pacific Reporter, 115, as to the respective rights of an appropriator of water to be used beyond the watershed, and of one claiming an uninterrupted flow of these waters to supply, by percolation, a water-bearing stratum underneath his land and connected with the stream, has not been heretofore presented.

It would be a waste of time to particularly discuss the reasons which impelled the modification of the common-law doctrine of an absolute right in each landholder to abstract all percolating waters underneath his land and dispose of them as he saw fit, without regard to what extent he might deplete these waters under the lands of his neighbors. The climatic conditions of California, the great stretches of arid and semi-arid lands, the uncertainty of the seasons and varying rainfall, the necessity of irrigation, and the vast superiority of underground waters as a steady and ready means of irrigation over the uncertainty of a similar supply from a surface stream which, in many instances becomes dry at the very time when irrigation is necessary; the vast areas of land brought under cultivation and production by irrigation, and additional areas still to be improved by it; the enormous draft which this constant improvement and cultivation makes on a supply which is limited, and which will become inadequate for all as population increases and additional lands are to be brought under cultivation and improved by irrigation—these, and many other causes, impelled a departure from the old doctrine and a limitation of it, and the adoption of the just principle that a common and essential necessity—water—when supplied to well-defined strata from whatever source, should be preserved to lands overlying them for reasonable use upon them.

The right of a person owning land upon a channel of underground water is not measured by whether the water is under pressure or not, but by considering whether the waters

come to him in a natural defined flow so as to constitute a part or parcel of his lands.

The owner of land having an underground water-bearing stratum supplied by the flood waters of a stream has a primary right to the full flow of such waters, in order to bring his stratum up to its water-bearing capacity. In torrential streams floods vary in extent with different seasons and in different years, and those of one season or one year may be insufficient to supply the underground stratum connected with the stream, while those of another season or year may be more than sufficient. While the owner of the underground stratum is only entitled to the flow of the flood waters to the extent that they may replenish his water-bearing stratum, still his right to the accustomed flood flow of the stream for that purpose is paramount to that of the right of an appropriator to divert any of the waters beyond the watershed. If the accustomed flow is more than necessary to supply the underground stratum, the burden of proof is upon the appropriator seeking to appropriate the surplus to show that there is a surplus.

As between riparian owners, it was conceded, as the law declares, that one riparian owner is not entitled to divert the waters of a stream for use at some distant point for commercial purposes so as to prevent another riparian owner to whom they would otherwise be available from using them on his lands, and it is established by the authorities that, as between owners of land overlying a common substratum of percolating water, this cannot be done. This being so, the court perceives no reason why the same rule should not be applied as between owners of land overlying a substratum of water directly connected with either the surface or sub-surface flow of the stream, and deriving practically its exclusive supply from that source. The theory upon which the right of a riparian owner to be protected in the use of the waters of a stream to which his lands are riparian is that, nature having given these lands the benefit of the flow, and the natural advantage of its use on the lands, one riparian owner may not divert these waters to lands not riparian, to the injury of another riparian owner who can use them. The same principle has been applied to the use of waters as between the owners of lands overlying a common stratum of percolating waters. And the court perceives no reason why the same principle should not be applied as between an appropriator of the waters of a stream to be taken beyond the watershed for commercial purposes and the owners of lands overlying an artesian stratum which is conclusively shown to be so connected with the stream as to derive its supply of water by percolation therefrom to this stratum. Why, in principle should there be any distinction? With the common-law doctrine modified to meet the conditions in this state necessitating it, and modified so as to preserve to each owner of lands overlying a common stratum of percolating waters a right to a fair and reasonable use of these waters of which their lands have a natural advantage, no reason suggests itself why the same rule should not apply as between the appropriators of the waters of a stream for use elsewhere than on riparian lands and the owners of lands overlying a water-bearing channel, so directly connected with the stream as to be supplied by percolation from it.

Lands are invariably purchased in view of the benefits which they may derive from being riparian to a stream or overlying well-supplied strata of water, the right to the flow or extraction of which is a part and parcel of the land, and there is no rational basis for any distinction between the classes as to the right to prevent a diversion of waters for use elsewhere, whether it be attempted by a riparian owner against another riparian owner, or by one owner of land over a common stratum of underlying water against another owner, or by an appropriator of the waters of a stream as against the owner of land overlying the water-bearing stratum directly supplied by percolation from the stream. As far as the owner of lands overlying a gravel stratum is concerned, it makes no difference in his rights, as against an appropriator of the water, from what source the supply comes which directly supplies his water-bearing stratum—whether from a stream or a saturated plane or other body of water which by natural flow or percolation, either surface or subterranean, clearly supplies his underground stratum. It would present an anomalous condition of the law were it the rule that, while a riparian owner may prevent an appropriator from diverting to his injury the waters of the stream for use beyond the watershed, and one owner of land overlying a common stratum of percolating water may restrain another owner similarly situated from making a like diversion, the owner of lands whose underlying stratum of water is directly and clearly supplied by percolation from the waters of the stream, and who will be greatly injured by a diversion, is not entitled to prevent it. There is no reason or any difference in the rule between the classes and none should exist. Such landowner has a right to restrain a diversion from the stream or saturated plane, or other well-defined supply, by an appropriator or any one else who seeks to divert such stream or other supplying waters from their natural percolating flow, for use elsewhere than upon lands to which, as waters of the stream, they are riparian, or which, as waters of an underground stratum, may reasonably and usefully be applied to the overlying land.

There can be no question but that an appropriator of water may divert for use, to any point beyond the watershed, any portions of the waters of a stream which can serve no useful purpose either to the riparian owners, or which might serve no such purposes in supplying the underground stratum of a landowner, or which are in excess of the quantity necessary for that purpose. But it is quite obvious that merely because waters are flood or storm waters of a stream—that is, on account of unusual rains the waters of a stream are increased beyond the normal flow—these flood or storm waters are not therefore surplus waters of the stream which serve no useful purpose, and are subject to appropriation.

Organization, Work, and Publications of Irrigation Investigations

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Gordon H. True, University of Nevada, in charge of work in Nevada.

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J. C. Fitterer, University of Wyoming, studies of duty of water in Wyoming.

Irrigation Farmers.

John H. Gordon, R. G. Hemphill, W. H. Lauck, R. E. Mahoney and John Krall, Jr.

Scope of the Work.

The Irrigation Investigations of the Office of Experiment Stations are governed by the following clause of the act making appropriation for the U. S. Department of Agriculture for the year ending June 30, 1910:

"**Irrigation Investigations.**—To enable the Secretary of Agriculture to investigate and report upon the laws of the States and Territories as affecting irrigation and the rights of appropriators and of riparian proprietors and institutions relating to irrigation and upon the use of irrigation waters, at home and abroad, with especial suggestions of the best methods for the utilization of irrigation waters in agriculture, and upon the use of different kinds of power and appliances for irrigation, and for the preparation and illustration of reports and bulletins on irrigation."

The purpose of the Irrigation Investigation is a better use of water supply in those sections of the country where irrigation is practiced. The work is divided into three general classes:

(1) The study of the adaptation of the laws and other institutions governing the use of water to the needs of the agricultural industry.

(2) Scientific and technical investigations of losses of irrigation water by evaporation, seepage, and in distribution; of the relation of irrigation to the quantity and quality of crops; of the adaptation of methods of applying water to soils and crops; and of the measurement, distribution, storage and pumping of water for irrigation.

(3) The collecting and publishing of practical information regarding irrigation practice.

Publications of the Office of Experiment Stations relating to Irrigation Corrected to June 1, 1910.

(We present herewith an authentic list of these pub-

lications at present available, to the general public, either by free distribution or by purchase of the Superintendent of Documents, together with a list of those restricted, for free distribution, to libraries, educational institutions, etc., and eliminating all those documents which are now out of print and which are not, therefore, procurable.

This is the first time this information has been presented in an up-to-date manner and we are indebted to the Office of Irrigation Investigations for their courteous co-operation, making this presentation possible.

Our readers are urged to retain this list for possible future reference as it will not be reproduced in the near future.)

The Farmers' Bulletins are for free distribution to all persons applying for them as long as they are available, upon application to "The Secretary of Agriculture, Washington, D. C."

Those publications marked "for sale" are to be obtained only from the "Superintendent of Documents, Washington, D. C.," upon payment in currency of the price named.

The free distribution of publications marked "for restricted free circulation and for sale" is confined to libraries, educational institutions, etc., where they may be consulted by the general public. Requests for such publications upon the part of such qualified persons and institutions should be addressed to "U. S. Department of Agriculture, Office of Experiment Stations."

Those with price attached may be procured by anyone upon payment of the purchase price in currency, of the Superintendent of Documents, Washington, D. C.

Farmers' Bulletins—for free distribution, to be had upon application to "The Secretary of Agriculture, Washington, D. C.," stating number of bulletin and title.

Farmers' Bulletin, No. 138.—Irrigation in Field and Garden. By E. J. Wickson, M. A., Pp. 40, figs. 18.

This bulletin discusses the subject from the standpoint of the individual farmer and contains instructions on the determination of ditch levels, the measurement of small streams, sources of water supply and their use, the distribution of irrigation water, methods of applying water, the choice of an irrigation method, and the time for the application of water.

Farmers' Bulletin, No. 158.—How to Build Small Irrigation Ditches. By C. T. Johnston and J. D. Stannard, Assistants in Irrigation Investigations, Office of Experiment Stations. Pp. 28, figs. 9.

This is a reprint of an article in the Yearbook of the Department of Agriculture for 1900, entitled "Practical Irrigation," giving methods for laying out and building small irrigation ditches, using only such implements as are found on most farms or can easily be made by the farmer.

Farmers' Bulletin, No. 263.—Practical Information for Beginners in Irrigation. By S. Fortier. Pp. 40, figs. 25.

This gives suggestions as to the selection of an irrigated farm, the acquirement of a water right, the preparation of land for irrigation, the construction of farm ditches, and the application of water to crops.

Farmers' Bulletin, No. 277.—The Use of Alcohol and Gasoline in Farm Engines. By C. E. Lucke and S. M. Woodward. Pp. 40, figs. 12.

This gives the general results of experiments in the use of alcohol in the ordinary internal combustion engines on the American market, with some discussion of foreign experiments.

Farmers' Bulletin, No. 371.—Drainage of Irrigated Lands. By C. F. Brown. Pp. 52, figs. 19.

Describes many experiments to determine best methods of reclaiming irrigated lands which have been injured by seepage or by the rise of alkali, or by both combined. Draws deductions from these experiments and describes methods of draining various classes of irrigated lands.

Farmers' Bulletin, No. 392.—Irrigating Sugar Beets.

Farmers' Bulletin, No. 394.—Irrigating by Windmills.

Farmers' Bulletin, No. 399.—Irrigation of Grain.

Farmers' Bulletin, No. 404.—Irrigation of Orchards.

Publications for Sale (to be acquired by purchase only)—Address "Superintendent of Documents, Washington, D. C. Order by number and complete title.

Bulletin No. 60.—Abstract of Laws for Acquiring Titles to Water from the Missouri River and its Tribu-

taries, with the legal forms in use. Compiled by Elwood Mead, State Engineer of Wyoming. Pp. 77. Price 10 cents.

(Includes abstracts of laws and legal forms in use in Colorado, Kansas, Montana, Nebraska, South Dakota, Wyoming, and the Northwest Territories of Canada. This bulletin is out of print and much of it is out of date, on account of the passage of new laws.)

Bulletin No. 100.—Report of Irrigation Investigations in California, under the direction of Elwood Mead, expert in charge. Pp. 411, pls. 29, figs. 16. Price, paper, 90 cents; cloth, \$1.25.

This report deals with investigations carried on during the summer of 1900 in co-operation with the California Water and Forest Association. In addition to a review of the agricultural situation in the state it presents a comprehensive discussion of the water laws and customs under which irrigation is practiced in California as typified by the conditions in Honey Lake Basin, and on Yuba River, Cache Creek, Salinas River, San Joaquin River, Kings River, Los Angeles River, and San Jacinto River.

Bulletin No. 105.—Irrigation in the United States. Testimony of Elwood Mead, Irrigation Expert in Charge, before the United States Industrial Commission, June 11 and 12, 1901. Pp. 47, pls. 12, fig. 1. Price, 15 cents.

This statement made before the Industrial Commission deals chiefly with the legal status of irrigation, touching on state control, national aid to irrigation, and the disposal of the public grazing lands. The necessity and possibility of storage are also discussed.

Bulletin No. 130.—Egyptian Irrigation. By Clarence T. Johnston, Assistant Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 100, pls. 24, figs. 9. Price, 30 cents.

This is a study of the irrigation laws and practices in Egypt, made with special reference to suggestions for improvements in American irrigation.

Bulletin No. 131.—Plans of Structures in Use on Irrigation Canals in the United States, prepared under the direction of Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 51, pls. 22. Price, 60 cents.

This is an album of plans for irrigation structures, designed by leading irrigation engineers of the West, made from drawings exhibited at Paris in 1900 and at Buffalo in 1901.

Bulletin No. 133.—Report of Irrigation Investigations for 1902.—Part 3.

Rice Irrigation in Louisiana and Texas, by Frank Bond. Third Progress Report on Silt Measurements, Texas, by J. C. Nagle. Irrigation Experiments at the Missouri Experiment Station, by H. J. Waters. Irrigation in Wisconsin in 1902, by A. R. Whitson. Irrigation Investigations in New Jersey, 1902, by E. B. Voohees. The Use of Pumps for Irrigation in Hawaii, by Jared G. Smith. Price, 15 cents.

Bulletin No. 145.—Preparing Land for Irrigation and Methods of Applying Water. Prepared by the Agents of Irrigation Investigations. Pp. 84, pls. 7, figs. 33. Price, 15 cents.

This bulletin gives descriptions of methods of removing sagebrush, of smoothing land, of laying out fields for different systems of applying water, and of the different systems of applying water. The various methods are compared as to cost and efficiency.

Bulletin No. 146.—Current Wheels: Their Use in Lifting Water for Irrigation. Prepared in the Office of Experiment Stations, Irrigation Investigations. Pp. 38, pls. 4, figs. 21. Price, 10 cents.

Drawings and photographs of a large number of wheels used for raising water from streams are given, accompanied by descriptions, statements of cost, and discussions of efficiency. A general discussion of the theory of current wheels is also given.

Bulletin No. 158.—Annual Report of Irrigation Investigations.—1904.

Separate No. 4. Irrigation in Klamath County, Oregon, by F. L. Kent. Irrigation Investigations in the Yakima Valley, Washington, by O. L. Waller. Irrigation Conditions in Raft River Water District, Idaho, 1904, by W. F. Bartlett. Price 5 cents.

Bulletin No. 167.—Irrigation in the North Atlantic

States. By Aug. J. Bowie, Jr. Pp. 50, figs. 7. Price 10 cents.

This report contains descriptions of a large number of small irrigation plants in Maryland, Pennsylvania, New Jersey, New York, Rhode Island, and Massachusetts.

Bulletin No. 168.—The State Engineer and His Relation to Irrigation. By R. P. Teele, Expert in Irrigation Institution, Irrigation Investigations, Office of Experiment Stations. Pp. 99, fig. 1. Price 15 cents.

In the arid region of the United States, whatever there is of public control over the use of water in irrigation is centered in the office of State Engineer in the various States. This bulletin discusses the whole subject of public control of the use of water, sketching the history of such control in the various States and giving its present status and efficiency.

Bulletin No. 179.—Small Reservoirs in Wyoming, Montana, and South Dakota. By F. C. Herrman. Pp. 100, pls. 8, figs. 13. Price 20 cents.

This bulletin contains the description of a number of reservoirs which have been built on the plans for storage of storm waters for irrigation and for stock water. It describes methods of construction and gives costs and returns from the use of water.

Bulletin No. 181.—Mechanical Tests of Pumping Plants in California. By J. N. LeConte and C. E. Tait. P. 72, figs. 4. Price 10 cents.

This gives the results of tests of a large number of pumping plants in use for irrigation in southern California.

Circular 48.—What the Department of Agriculture is doing for Irrigation. By Elwood Mead, Chief of Irrigation Investigation. Pp. 4. Price 5 cents.

Circular 58.—Irrigation in the Valley of Lost River, Idaho. By A. E. Wright. Pp. 24. Price 5 cents.

Circular 59.—Progress Report of Co-operative Irrigation Investigations in California. By Samuel Fortier. Pp. 23. Price 5 cents.

Circular No. 65.—Irrigation from Upper Snake River, Idaho. By H. G. Raschbacher. Pp. 16, fig. 1. Price 5 cents.

Circular No. 67.—Investigation of Irrigation Practice in Oregon. By A. P. Stover, Irrigation Engineer, Irrigation Investigations, Office of Experiment Stations. Pp. 50, figs. 4. Price 5 cents.

Document No. 318.—Preparing Land for Irrigation. By R. P. Teele. Pp. 239-250, pls. 2, figs. 5. (Reprint from Yearbook, 1903.) Price 5 cents.

Discusses implements, methods, and costs.

Document No. 670.—Review of Irrigation Investigations for 1903. By Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 1v, 469-502, pls. 6. (Reprint from Annual Report of Office of Experiment Stations for 1903.) Price 5 cents.

Publications "for restricted free circulation and for sale."

Bulletin No. 70.—Water-right Problems of Bear River. By Clarence T. Johnston and Joseph A. Breckons. Pp. 40, pls. 9. Price 15 cents.

Presents some of the water-right complications of interstate streams as illustrated on Bear River. The bulletin discusses the water supply of the river and its diversion, the controversies which have arisen regarding water rights, and the need of uniform laws.

Bulletin No. 108.—Irrigation Practice Among Fruit Growers on the Pacific Coast. By E. J. Wickson, M. A., Professor of Agricultural Practice, University of California, and Horticulturist of the California Agricultural Experiment Station. Pp. 54, pls. 10, figs. 7. Price 15 cents.

This bulletin gives the results of a special investigation into the conditions, extent, and methods of irrigation as practiced among fruit growers of the Pacific Coast.

Bulletin No. 118.—Irrigation from Big Thompson River. By John E. Field, Assistant State Engineer of Colorado. Pp. 75, pls. 5, fig. 1. Price 10 cents.

This is a study of the water laws of Colorado as illustrated by irrigation from Big Thompson River. Mr. Field discusses more particularly the "water loaning" law.

Bulletin No. 119.—Report of Irrigation Investigations for 1901, under the direction of Elwood Mead, Chief of Irrigation Investigations. Pp. 401, pls. 64, figs. 12. Out of print. Separate parts, as below listed, only, are available.

This is the third of the annual reports of the Irrigation Investigations of this Office. It deals chiefly with the duty of water, but contains also reports from four stations in the humid states, where irrigation is not a necessity, but a means of increasing the returns from farm lands; a report on the underground water supply of the San Bernardino Valley, California, and the second progress report on slit measurements. This report has been reprinted in four parts in the form of separates, available as follows:

Part 1. Summary of Results. By R. P. Teele. Irrigation in New Mexico, by W. M. Reed. Irrigation Investigations in Salt River Valley, Arizona, by W. H. Code. Irrigation at the Arizona Experiment Station Farm. By A. J. McClatchie.

Part 2. Subterranean Water Supply of the San Bernardino Valley, California, by L. W. Hilgard. Duty of Water under Gage Canal, Riverside, Cal. By W. Irving. Use of Water in Irrigation in Washington. By O. L. Waller.

Part 3. The Distribution of Water from Canals in Idaho. By D. W. Ross. Investigations in Montana, 1901. By Samuel Fortier. Irrigation in Bear River Valley, Utah. By Arthur P. Stover. Irrigation in Grand and Arkansas Valleys, Colorado. By Arthur P. Stover.

Part 4. Irrigation under the Great Eastern Canal, Loup River, Nebraska. By O. V. P. Stout. Irrigation at the Missouri State Experiment Station. By H. J. Waters. Irrigation Experiments in Wisconsin, 1901. By F. H. King. Irrigation in New Jersey, in 1901. By E. B. Voorhees. Second Progress Report on Silt Measurements, Texas. By J. C. Nagle.

Bulletin No. 124.—Report of Irrigation Investigations in Utah, under the direction of Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Including General Discussions of Irrigation in Utah, and Irrigation from Jordan River, by R. P. Teele; Irrigation in Utah Lake Drainage System, by A. P. Stover; The Spanish Fork River Irrigation System, by A. F. Doremus; Irrigation in the Weber Valley, by Jay D. Stannard; Agriculture under Irrigation in the Basin of Virgin River, and Court Adjudication of Water Rights on Sevier River, by Frank Adams; and Appropriations of Water from Logan River, by George L. Swendson. Pp. 330, pls. 19, figs. 2. Price \$1.10.

A detailed study of the irrigation laws, institutions, and practice of Utah.

Bulletin 134.—Storage of Water on Cache la Poudre and Big Thompson Rivers. By C. E. Tait. Pp. 100. Price 10 cents.

Bulletin No. 144.—Irrigation in Northern Italy—Part I. By Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 100, frontispiece, pls. 16, figs. 14. Price 20 cents.

This is the first of three bulletins to be published giving the results of a study of Italian irrigation practice, laws, and institutions. The study was made solely from the standpoint of getting suggestions for improvements in our American systems, and it was found that we could learn much from Italy. The first bulletin contains reports on irrigation in Lombardy and Piedmont. (See also Bulletins 190 and 192.)

Bulletin No. 148.—Report on Irrigation Investigations in Humid Sections of the United States in 1903, under the direction of Elwood Mead, Chief of Irrigation Investigations. Pp. 45, pls. 3. Price 10 cents.

This bulletin contains descriptions of several irrigation plants in market gardens near the large eastern cities, and report of experiments with irrigation in New Jersey and Missouri; also a report on irrigation in the artesian basin of South Dakota.

Bulletin No. 157.—Water Rights on Interstate Streams: the Platte River and Tributaries. By R. P. Teele and Elwood Mead. Pp. 118, pls. 4, figs. 3. Out of print, but separates (only) are available.

The Platte River and its tributaries lie within three states—Colorado, Wyoming, and Nebraska. The one source of supply is therefore subject to the laws of three states. This report is a discussion of the rights to water from this source of supply, as they have arisen under the laws and physical conditions in the three states. Mr.

Teele gives the results of the field work and Doctor Mead a general discussion of water laws. These discussions have been printed as separates, which are available for distribution.

Bulletin No. 172.—Irrigation in Montana. By Samuel Fortier; assisted by A. P. Stover and J. S. Baker. Pp. 100, figs. 18. Price 15 cents.

This bulletin is a result of a study of typical sections of Montana, made for the purpose of determining the status and possibilities of irrigation in that state. It covers ditch construction, agricultural practice, ditch management, seepage losses, return seepage and public control of streams.

Bulletin No. 177.—Evaporation Losses in Irrigation and Water Requirements of Crops. By S. Fortier. Pp. 64, pls. 2, figs. 19. Price 10 cents.

This contains the results of tank experiments to determine the quantities of water evaporated from soils which receive various cultural treatments and to which the water was applied at different depths; it contains also a few experiments on the quantities of water consumed by plants.

Bulletin No. 183.—Mechanical Tests of Pumps and Pumping Plants Used for Irrigation and Drainage in Louisiana in 1905 and 1906. By W. B. Gregory. Pp. 72, figs. 4. Price 15 cents.

This contains the results of tests of a number of the large pumping plants in use in Louisiana. These are among the largest pumps used for irrigation in the United States, and in general they use crude oil for fuel, making the tests of especial interest on account of these unusual conditions.

Bulletin No. 188.—Irrigation in the Yakima Valley, Washington. By S. O. Jayne. Pp. 89, pls. 2, figs. 4. Price 15 cents.

This bulletin describes the irrigation works in the Yakima Valley, Washington, and discusses the water supply, water rights, crops, and opportunities for settlement.

Bulletin No. 190.—Irrigation in Northern Italy—Part II. By Elwood Mead. Pp. 86, pls. 4, figs. 1. Price 15 cents.

Part I. of this report is Office of Experiment Stations, Bulletin No. 144. Part II., covers the section watered by the Odda and Adige rivers, and deals especially with the operation of irrigation laws, and the organization for the operation of irrigation works.

Bulletin No. 191.—Tests of Internal Combustion Engines on Alcohol Fuel. By C. E. Lucke and S. M. Woodward. Pp. 89, pls. 20, figs. 13. Price 20 cents.

This bulletin gives the detailed results of tests of alcohol fuel in internal combustion engines made for the use of gasoline and kerosene.

Bulletin No. 192.—Irrigation and Drainage Laws of Italy. Translated by R. P. Teele. Pp. 100. Price 15 cents.

This bulletin contains the texts of the general irrigation and drainage laws of Italy and the regulations for putting them into effect.

Bulletin No. 201.—Cost of Pumping from Wells for the Irrigation of Rice in Louisiana and Arkansas. By W. B. Gregory. Pp. 39, figs. 2. Price 10 cents.

This bulletin contains descriptions of a number of the smaller pumping plants used in securing a supply of water for rice irrigation, with tests of fuel consumption, to determine the cost of such supplies.

Bulletin No. 203.—Distribution of Water in the Soil in Furrow Irrigation. By R. H. Loughridge. Pp. 63, figs. 19. Price 10 cents.

This bulletin contains the results of experiments to trace the water applied to orchard soils in irrigation to determine how large a part of the water used remains in the root zones of the trees and how much percolates beyond their reach.

Bulletin No. 205.—Irrigation in Wyoming. By C. T. Johnston, State Engineer. Pp. 60, pls. 3, figs. 22. Price 15 cents.

This bulletin is one of a series on irrigation in the several arid States, published for the purpose of supplying to intending settlers information as to opportunities for settlement, and the conditions to be met.

(Continued in July number.)

"THE ARID WEST, CRADLE OF THE BEST AMERICAN."

In one of the editorial expressions of the May issue of this journal, several statements were made, based upon intimate acquaintance and knowledge extending over a period of many years, relative to the physiological effects of residence in the arid west as seen through the eyes of a layman.

Some of these statements may, to one whose experience of life has been confined to the regions east of the Mississippi, appeared overdrawn, or as the vaporings of the heated imagination, to which the ultra-conservative element, appears to attribute any and all encomiums of the West, or to be explicit, that part of the United States west of the 100th meridian.

It is, and has been in the past, unfortunately true, that practically all the information available upon the subject of climatic environment and its influence upon human and brute development, has been confined, on the one hand, to the researches of Antiquarians and Anthropologists and on the other hand, to statements made by the ordinary layman—too often applying purely personal observations to the race at large and to those emanating from interested sources.

The medical profession heretofore has seen fit to treat this tremendously important subject almost wholly from the standpoint of a technical discussion of the influence of climate upon the individual in disease.

It is a relief to be able to turn to a discussion of the most abstruse and scientific phases of the matter, as applying to the individual in normal good health and as affecting the future of the race, written in a view at once dignified and capable of popular comprehension, and it is a source of gratification to see the arguments advanced by the IRRIGATION AGE, buttressed by the highest scientific authority.

We refer to the series of two remarkable articles appearing under the caption of this article in the May and June issues of the *Pacific Monthly* of Portland, Oregon, by Edward L. Munson, A. M., M. D. The articles are suggestive of a profound study of the subject and are profusely enlightened with charts from statistical tables of the census and weather bureaus. The opening passage, together with a reproduction of a few of its most salient pronouncements, will serve to indicate the character of the treatise which we earnestly exhort our readers of the East to study carefully.

"With the rapid development of our national territory and the peopling of its former waste places, the time is at hand when one may fairly undertake to determine the region within its geographical limits, in which there is reason to believe that the highest type of American may be evolved. This best type of our national life will, of course, be developed along the lines of heredity as modified by environment. We have, therefore, to consider the character of the original stock as subsequently influenced by climate, topography and social conditions in the evolution of this better class of American citizens. It will be assumed, at the outset, that the above several essentials will be found in our country, in best combination, in the mountainous plateau, lying between the Mexican border on the south and the Canadian frontier on the north and ranging from a north and south line marking the western thirds of Kansas and Nebraska on the east, to the Pacific Coast on the west."

Under the sub-head "The Original Human Stock," the author says:

"Clearly those who would venture into such hazardous surroundings were not only animated by ambition and strong in self-reliance, but were, also, physically able to endure the hardships which accompanied the perils. It has been well said of the California Argonauts. 'The cowards never started and the weak died on the road.'"

It points out the process whereby the weak were eliminated by the stern law of the survival of the fittest. "Always it was the better and more vigorous element which, impatient of existing conditions and methods, went forward to carry from eastern communities the frontier of civilization towards the setting sun."

After a discussion of the effect of this drain of its best manhood and the influx of immigration upon the east, it states, "All this is merely to illustrate the point

that the East can no longer be regarded as the present home of the pure, vigorous, Anglo-Saxon type, but that this has moved to the West, there to continue its power under far more favorable conditions, as the highest, best and controlling element of our national body politic." Speaking of the operation of the law of selection, "As like produces like, so the offspring of such sturdy parents grew into a vigorous second generation."

"As a result of such selected immigration, together with the influence of other powerful factors yet to be considered, the West contains today a physically far superior and more vigorous class of citizens than is found elsewhere—of the truth of which assertion a glance at a typical crowd anywhere in the arid West, as compared with a similar assemblage in the older East, will promptly convince the doubting."

Under the caption "The climate of arid America in its influence on the human family," a most complete and satisfactory analysis of the favoring influences of climate supported by authorities of undoubted authenticity is supplied. It is a matter of regret that the limits of space forbid the reproduction of the entire article which deserves to rank among the classics of technical literature, but a few excerpts from this sub-head must suffice, viz.: "As to the direct influence of the dry, sunny climate of the arid West upon the disposition of human beings resident therein there can be no question. In this favored region man is not constantly upon the defensive against nature and her moods, but genial climate renders life at once easy and pleasant. This climate is stimulating to a very high degree—genial and almost daily sunshine outside finds reflection in a bright cheery disposition and an optimistic frame of mind. It undoubtedly explains, to a very large degree, the proverbial western optimism which sees chiefly the best and most hopeful side of things, and is responsible for the routine, nonchalant undertaking and accomplishment of great affairs to which a more pessimistic East would regard as scarcely possible. Surely it is a tremendous asset to a community to possess a climate through the influence of which almost any achievement seems quite practicable."

(Continued from page 364.)

purposes; it shall be lawful for the Secretary of the Interior, upon application by the proper officer of any state or territory to which said section applies, to withdraw temporarily from settlement, or entry, areas embracing lands for which the state or territory proposes to make application under said section, pending the investigation and survey preliminary to the filing of maps and plats and application for segregation by the state or territory: Provided, That if the state or territory shall not present its application for segregation and maps and plats within one year after such temporary withdrawal the lands so withdrawn shall be restored to entry as though such withdrawal had not been made."

Other amendments extend the provisions of the act to the territories of New Mexico and Arizona and to portions of the Ute and Southern Ute Indian Reservations in southwestern Colorado, and provide for further grants (exceeding one million acres each) to the states of Idaho and Wyoming.

Amendments and Corrections to Former Articles.

IDAHO.—State Board of Land Commissioners (January issue), M. I. Church no longer register, having resigned. Successor not yet appointed. Acting register, ad interim, Heber Q. Hale. (May issue.) Inquiries of a general nature regarding Carey Act projects at large should be addressed to Joseph P. Fallon, commissioner of Immigration, or to Heber Q. Hale, acting land register, both of Boise, Idaho. "Pratt Irrigation Company" segregation not open to entry, and opening indefinitely postponed.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.

Department of Agriculture— Latest Publications.

[To obtain those publications to which a price is affixed, application must be made to the **Superintendent of Documents, Government Printing Office, Washington, D. C.**, to whom all remittances must be directed. Stamps and personal checks will not be accepted.]

The Superintendent of Documents is not an official of the Department of Agriculture.

Publications for free distributions i. e., those to which no price is attached, may be obtained upon application to the Secretary of Agriculture, Washington, D. C. Free publications are not distributed by the Superintendent of Documents. In all cases where officials desire to exchange publications applications should be made to the Department of Agriculture.

The Department of Agriculture does not distribute nor control the distribution of publications of the **State Agricultural Experiment Stations**. Application for them should be made to the several stations in the different States.

A List of Publications for free distribution revised to April 1, 1910, and a separate list of publications for sale (by the Superintendent of Documents) revised to October 1, 1909, may be procured free of charge upon application to the Secretary of Agriculture, Washington, D. C.

The list appended includes all publications of general interest and value issued since the appearance of the above-mentioned "Lists of Publications."

BUREAU OF SOILS 1908, ADVANCE SHEETS.

SOIL SURVEY OF WESTERN NORTH DAKOTA. By Macy H. Lapham and Party. Pp. 80, pls. 6 fig. 1. map.

REPORTS.

YEAR BOOK OF U. S. DEPARTMENT OF AGRICULTURE. 1909; Pp. 652 pls. 36 fig. 36. Price, cloth, \$1. The Yearbook contains the annual report of the Secretary of Agriculture. 152 pages and 23 miscellaneous papers. 263 pages, covering a wide variety of subjects thoroughly representative of the varied scientific work conducted by the department; also an appendix, 202 pages, and index, 34 pages. The appendix contains the annual statistical tables covering production and prices of the principal crops and farm animals, and the imports and exports of agricultural products. Among the new features in the portion devoted to agricultural statistics are tables showing the rice crops of the United States from 1712 to 1909, and the crops from 1790 to 1909, ocean freight rates on grain and cotton from United States to European ports, and average receipts for freight transportation on railroads in the United States from 1890 to 1908.

TWENTY-FIFTH ANNUAL REPORT OF THE BUREAU OF ANIMAL INDUSTRY, 1908 Pp. 502 pls. 11, figs. 72. Price, cloth, 70 cents.

BULLETINS.

SOME INSECTS INJURIOUS TO TRUCK CROPS: Contents and Index to Bulletin 68, Bureau of Entomology. Pp. x, 99-108. Price 5 cents.

THE CLOVER-ROOT CURCULIO. By V. K. Wildermuth, Agent and Expert. Pp. 29-38 figs. 5 Bulletin 85, Part 3, Bureau of Entomology. Price 5 cents.

TECHNICAL RESULTS FROM THE GIPSY MOTH PARASITE LABORATORY. II. Descriptions of Certain Chalcidoid ASITE LABORATORY. II. DESCRIPTIONS OF CERTAIN CHALCIDOID PARASITES. By J. C. Crawford, Assistant Curator, Division of Insects U. S. National Museum. Pp. 13-24 (Bulletin 19, Part II, Technical series, Bureau of Entomology). Price 5 cents.

EXPERIMENT STATION RECORD, Vol. XXII. Index Number. F. W. Allen, Ph. D., Editor. Pp. xiii, 801-911. Price 15 cents.

EXPERIMENT STATION RECORD, Vol. XXII, No. 3, March 1910. E. W. Allen, Ph. D., Editor. Pp. ix, 201-300.

Same, Vol. XXII, No. 4, Abstract Number. Pp. ix, 301-400.

Same, Vol. XXII, No. 5, April 1910. Pp. viii, 401-500.

[The record contains numerous abstracts of the publications of the agricultural experiment stations and kindred institutions, in this and other countries, articles and editorials on topics of special interest in agricultural science by American and foreign experts, and notes on the experiment stations. Note—For the convenience of those who desire to receive this publication regularly the Superintendent of Documents has fixed the price of this serial, which is now issued in two volumes a year, 8 numbers each at \$1 per volume, payable in advance. Current numbers are not sold separately.]

TRACTION PLOWING. By L. W. Ellis, Assistant, Office of Farm Management. Pp. 45 fig. 1. (Bulletin 170, Bureau of Plant Industry.) Price 10 cents.

SEASONAL NITRIFICATION AS INFLUENCED BY CROPS AND TILLAGE. By C. A. Jensen, Agriculturist. Pp. 31, figs. 7. (Bulletin 173, Bureau of Plant Industry.) Price 10 cents.

THE CONTROL OF THE PEACH BROWN-ROT AND SCAB. By W. M. Scott, Pathologist, and T. Willard Ayers, Scientific Assistant, Fruit-Disease Investigation. Pp. 31, pls. 4, fig. 1. (Bulletin 174, Bureau of Plant Industry.) Price 10 cents.

A PROTECTED STOCK RANGE IN ARIZONA. By David Griffiths, Agriculturist, Office of Farm Management. Pp. 28, pls. 6, fig. 1. (Bulletin 177, Bureau of Plant Industry.) Price 15 cents.

CIRCULARS.

THE PREVENTION OF LOSSES AMONG SHEEP FROM

STOMACH WORMS (*Haemonchus Contortus*). Pp. 10. (Circular 157, Bureau of Animal Industry.)

IMPROVED METHODS FOR THE PRODUCTION OF MARKET MILK BY ORDINARY DAIRIES. By C. B. Lane, Senior Dairymen, and Karl E. Parks, Architect, Dairy Division. Pp. 12, figs. 11. (Circular 158, Bureau of Animal Industry.)

THE HORN FLY (*Haematobia serrata* Rob.—Desv.). By C. L. Marlatt, Assistant Entomologist. Pp. 13, figs. 6. (Circular 115, Bureau of Entomology.)

THE CLOVER ROOT-BORER. By F. M. Webster, in charge of Cereal and Forage Insect Investigations. Pp. 5, figs. 4. (Circular 119, Bureau of Entomology.)

THE CONTROL OF THE BROWN-ROT AND PLUM CURCULIO ON PEACHES. By W. M. Scott of the Bureau of Plant Industry, and A. L. Quaintance, of the Bureau of Entomology. Pp. 7. (Circular 120, Bureau of Entomology.)

THE OYSTER SHELL SCALE AND THE SCURFY SCALE. By A. L. Quaintance, in charge of Deciduous Fruit Insect Investigations, and E. R. Sasser, Scientific Assistant. Pp. 15, figs. 2. (Circular 121, Bureau of Entomology.)

EXPERIMENTS IN SUPPLEMENTAL IRRIGATION WITH SMALL WATER SUPPLIES AT CHEYENNE, WYO., IN 1909. By John H. Gordon, Irrigation Farmer, in charge. Prepared under the Direction of Samuel Fortier, Chief, Irrigation Investigation. Pp. 11, fig. 1. (Circular 95, Office of Experiment Stations.)

HOW TO TEST SEED CORN IN SCHOOLS. Pp. 7, figs. 4. (Circular 96, Office of Experiment Stations.)

FRUIT GROWING FOR HOME USE IN THE CENTRAL AND SOUTHERN GREAT PLAINS. By H. P. Gould, Pomologist in charge of Fruit District Investigations. Pp. 23, figs. 5. (Circular 51, Bureau of Plant Industry.)

WART DISEASE OF THE POTATO: A DANGEROUS EUROPEAN DISEASE LIABLE TO BE INTRODUCED INTO THE UNITED STATES. By W. A. Orton, Pathologist, and Ethel C. Field, Scientific Assistant, Cotton and Truck Diseases and Sugar-Plant Investigations. Pp. 11, pls. 2. (Circular 52, Bureau of Plant Industry.)

THE SUBSTITUTION OF LIME-SULPHUR PREPARATIONS FOR BORDEAUX MIXTURE IN THE TREATMENT OF APPLE DISEASES. By W. M. Scott, Pathologist in charge of Orchard-Spraying Experiments. Pp. 15, figs. 3. (Circular 54, Bureau of Plant Industry.)

AMERICAN EXPORT CORN (MAIZE) IN EUROPE. By John D. Shanahan, Crop Technologist in charge, and Clyde E. Leighty, and Emil G. Boerner, Assistants, Grain Standardization. Pp. 42, figs. 7. (Circular 55, Bureau of Plant Industry.)

MONTHLY LIST OF PUBLICATIONS, MARCH 1910 (FOREIGN). Pp. 4. (Document 706, Division of Publication.)

SAND-CLAY AND EARTH ROADS IN THE MIDDLE WEST. By W. L. Spoon, Superintendent of Road Construction, Office of Public Roads. Pp. 31, figs. 6. (Circular 91, Office of Public Roads.)

CROP REPORTER, vol. 12, No. 3, March, 1910. Pp. 17-24. (Bureau of Statistics.)

Same, Vol. 12, No. 4, April 1910. Pp. 25-32. (Bureau of Statistics.) The Crop Reporter is a two column quarto publication devoted to agricultural statistics.

FARMERS' BULLETINS.

THE PRESERVATIVE TREATMENT OF FARM TIMBERS. By C. P. Willis, Forest Assistant, Forest Service. Pp. 19, figs. 5. (Farmers Bulletin 387.)

EXPERIMENT STATION WORK, LVL. Compiled from publications of the agricultural experiment stations. Pp. 32, figs. 7. (Farmers Bulletin 388.)

Contents. Incompatibles in fertilizer mixtures—Principles of dry farming—Methods of seeding oats—Rolling vs. harrowing winter wheat—Destruction of cutworms in soil—Pruning—Bean anthracnose or pod spot—Animal feed for farm stock—Feeding the pig—Jelly and jelly making.

BREAD AND BREAD MAKING. By Helen W. Atwater. Pp. 47, figs. 7. (Farmers Bulletin 389.) This Bulletin discusses the important place of bread in the dietary, the different grains and flours used, yeast and other leavening agencies and the making, composition, and digestibility of different kinds of bread.

ECONOMICAL USE OF MEAT IN THE HOME. By C. F. Langworthy, Expert in charge of Nutrition Investigations, and Caroline L. Hunt, Expert in Nutrition, Office of Experiment Stations. Pp. 43. (Farmers Bulletin 391.)

This bulletin has been issued as a result of the widespread interest in the utilization and preparation of the cheaper cuts of meats. It discusses the food value and proportional cost of different meats, and contains a number of recipes for simple and inexpensive dishes.

IRRIGATION OF SUGAR BEETS. By F. W. Roeding, Irrigation Manager, Office of Experiment Stations. Pp. 52, figs. 14. (Farmers Bulletin 392.)

This Bulletin contains information in regard to the early manufacture of beet sugar in European countries and the introduction of the sugar beet and the manufacture of beet sugar in the United States. It describes soils and climate suited to sugar beet growing, gives directions for the preparation and irrigation of the lands, describes implements necessary to the cultivation and harvesting of the crop, and contains statements as to the cost and returns of the crop.

SEPARATES.

From Twenty-fifth Annual Report, Bureau of Animal Industry 1908.

THE CONTROL OF HOG CHOLERA BY SERUM IMMUNIZATION. By A. D. Melvin, Chief, Bureau of Animal Industry. Pp. 219-224.

STATE LEGISLATION REGULATING THE STANDING OF STALLIONS AND JACKS FOR PUBLIC SERVICE. By Roy A. Cave, Herdbook Assistant, Bureau of Animal Industry. Pp. 335-344.

U. S. Reclamation Record.

A digest of the latest developments in connection with the United States Reclamation Service, including "Public Notices" and "Service Orders" of public interest.)

"Service Orders."

Procedure Under Foreclosure of Mortgage of Lands Subject to Reclamation Charges.

It is hereby ordered: Whenever in case of foreclosure of a mortgage given to secure a loan on land in private ownership, for which charges are payable for a water right under a reclamation project, the mortgagee buys in the land, no steps will be taken to cancel the water-right application on account of failure to maintain residence upon, or in, the neighborhood of the land, until the expiration of one year from the date of the foreclosure sale; provided, that all charges that may be due, or that may accrue during such interval, be paid, and, also, that within such period of one year, a water-right application for such land be filed by a qualified person, who, upon submitting satisfactory evidence of transfer of title, shall be entitled to a credit equal to all payments theretofore made on account of the water-right charges for said land. The mortgagee purchasing land hereunder must give prompt notice thereof to the engineer in charge of the project. (Approved by Secretary of the Interior March 5, 1910.)

Interest of Members of Congress in Contracts.

In view of the repeal of sections 3739, 3740 and 3742, Revised Statutes, and the provisions of sections 114-116 of the act approved March 4, 1909, effective Jan. 1, 1910 (35 Stat. L. 1109), the Secretary of the Interior has approved the following clause to be inserted in contracts in lieu of the clause heretofore used referring to members of congress.

"No member or delegate to Congress, or resident commissioner, after his election or appointment, and either before or after he has qualified, and during his continuance in office; and no officer, agent or employe of the government, shall be admitted to any share or part of this contract or agreement, or to any benefit to arise thereupon.

Nothing, however, herein contained shall be construed to extend to any incorporated company, where such contract or agreement is made for the general benefit of such incorporation or company, as provided in section 116 of the act of Congress approved March 4, 1909 (35 Stat. L. 1109.)

All contracts executed hereafter should contain this provision.

PUBLIC NOTICES.

Idaho, Minidoka Project.—On March 22, 1910, public notice was issued announcing that the portion of installment on account of operation and maintenance to become due Dec. 1, 1910, shall be 75 cents per acre of irrigable land, and the said rates shall remain in effect for subsequent years until further notice, the charges becoming due on December 1 of each year.

Nebraska-Wyoming, North Platte Project.—On March 12, 1910, public notice was issued to all entrymen and private landowners within the first lateral district, North Platte Project, whose entries and water-right applications continue under the provisions of the public notice of July 29, 1907, that the portion of the installment for operation and maintenance which must be paid on or before April 1, 1910, and on or before April 1 of each subsequent year, shall be \$2.00 per acre of irrigable land, until further notice.

Washington, Okanogan Project.—On March 12, 1910, public notice was issued, opening to irrigation lands included in the extension of the irrigable area of the Okanogan Project, shown on farm-unit plats T. 34 N., Rs. 26 and 27 E. W. M., approved Feb. 28, 1910. Homestead entries, applications for water rights, the charges, time and manner of payments will be governed by the terms of existing public notices and orders attached affecting the said project, except that for lands thereafter entered, the second installment shall be due on May 1 of the year after that in which entry is made and subsequent installments shall be due May 1 of each year thereafter until fully paid.

Nebraska-Wyoming, North Platte Project.—On April 4, 1910, public notice was issued in connection with the North Platte Project, Nebraska-Wyoming, announcing that entries made and water-right applications filed after May 2, 1910, for lands in the first lateral district must be accompanied by a payment equal to the sum of all installments which shall, at the time of such entry, or of the filing of water-right application, have become due, and remain unpaid, under the provisions of the public notices and orders in force for lands in said district, or which would have become due hereunder had the entry or water-right application been filed on March 4, 1909. The same notice also announced that all entries made and all water-right applications filed on and after May 2, 1910, for lands in the second lateral district, whether for public or private lands, shall be accompanied by a payment equal to the sum of all installments which shall at the time of such entry or of the filing of water-right application, have become due under the provisions of public notices and orders in force for lands within said district, or which would have become due thereunder had the entry or water-right application been filed on March 29, 1910.

Nevada, Truckee-Carson Project.—On April 26, 1910, public notice was issued announcing that for all irrigable lands shown on the approved farm-unit plats of lands under the Truckee-Carson Project the portion of the installment for operation and maintenance to become due December 1, 1910, and annually on the same day of each year thereafter, until further notice, shall be sixty cents per acre of irrigable land.

Washington, Okanogan Project.—On April 8, 1910, public notice was issued in connection with the Okanogan Project, Washington, revoking the provision of public notice of November 12, 1908, that for all applications for water rights filed after June 15 in any year, one installment of the charge for building operation and maintenance must be paid at the time of filing, but the portion for operation and maintenance shall be credited on account of the installment of said charge for the subsequent year.

Washington, Sunnyside Project.—On April 18, 1910, public notice was issued announcing the irrigability of additional lands in the Sunnyside Project, Washington, amended township plats being filed showing the additional areas subject to water-right application. Water will be furnished in 1910 for the additional lands shown on the list accompanying the notice, approved by the Secretary of the Interior and filed in the local land office. On April 19, 1910, public notice was issued revoking the provision of the public notice of November 18, 1908, that for all applications for water rights filed after June 15, 1909, or any subsequent year, one installment of the charge for building, operation and maintenance must be paid at the time of filing, but the portion for operation and maintenance shall be credited on account of the installment of said charge for the subsequent year.

Farms Available.

Reports from the field indicate for the following projects the approximate number of farms available for entry under the terms of the reclamation act:

Montana, Huntley Project	224
Montana, Sun River Project	85
Oregon, Umatilla Project	60
South Dakota, Belle Fourche Project	60
Wyoming, Shoshone Project	257

The record is for farms available on April 1, 1910.

Recent Publications of the United States Reclamation Service.

Maps.

These may be procured by ordering of the "U. S. Reclamation Service, Washington, D. C.," enclosing price attached.

"Belle Fourche" Project.

South Dakota, general map, No. 11690.
Scale, 2 m., 0.9 in., January, 1910.
8.6x14.9 in., 10c.

"Williston" Project, North Dakota.

General map, No. 11489.
Scale, 2 m., 0.8 in., December, 1909.
8.9x7 in., 5c.

(Continued from page 356.)

from a stream. If it can only construct such canal of such dimensions as will carry a quantity of water to supply lands within its own project, a large amount of land, outside, which might be irrigated if the canal were of larger capacity, will remain in an arid condition. In my judgment, if the bill is enacted into law, a much larger area of land may be reclaimed than is now possible under existing laws."

Senator Borah of Idaho, in the course of debate upon the measure, stated, among other things, "The reclamation law has been stiff, inelastic and harsh, and has worked untold hardships upon the settlers. It has compelled them to stand and wait until the government should get to them with the water and has absolutely tied the settlers' hands so they could not incorporate or do anything to hasten the delivery of the water or to help themselves.

"This bill permits the settlers to take aggressive action if they desire to and to join with their neighbors, or permits them to remain and deal in their individual capacity. The bill is drawn solely and absolutely in the interest of the settlers in the hope that we could expedite the getting of water upon some lands where it seems that it is to be long delayed. I know of two or three instances in Idaho, where, in my judgment, it will be a long time before the government puts water upon the particular lands, unless the settlers are enabled to organize an irrigation district, do a large portion of their own work and arrange with the government for the portion of the water which belongs to that particular portion of the project. * * * It is wholly optional with the settlers whether they shall proceed under the law or remain under the reclamation act.

"This bill in its whole purport, effect and purpose is to give a little more latitude and opportunity to settlers and private enterprises to aid in reclaiming arid lands, and to prevent the interminable delay which works such untold hardships, in some instances, upon the settlers. Everyone knows who has been over these projects that these settlers have paid about all the penalties they should pay for a do-nothing proposition, with reference to legislation. Since the Reclamation Act was passed eight years ago it has not been remedied in any respect whatever, and it has been defective from the hour it was passed. The time has come to get relief along as many lines as possible."



New American Turbines

will improve your water power because they are **EFFICIENT, POWERFUL and DURABLE.**

Our line of

HEAD GATES and HOISTS

is the most complete on the market, and we have patterns for all sizes and types. Don't forget that a reliable Head Gate is one of the important parts of any power plant.

Send for Catalogue 25.

The Dayton Globe Iron Works Co.

Dayton

Ohio



DRILLED WELLS FOR IRRIGATION



Make Every Well a Flowing Well

Flowing wells are not found in every locality, but they can be made to flow to their full capacity.

Every farm and every ranch should and can have their own water supply; a good well adds thousands of dollars to the value of a property.

The first item of expense is the only expense; a good well is inexhaustible and lasts for all time.

Big Profits in the Well Business

We want to send you our **FREE** book, "How to Make Money in the Well Business." It contains twenty pages from Sanderson's book, "Well Drilling, Methods and Cost," which is the only book published on the subject. It also describes our Advertising Plan which we are furnishing to our customers **FREE**.

Just drop us a postal today and we will show you how to handle a business in which there are **REAL PROFITS**.

ADDRESS (WELL DEPT.)

THE CYCLONE DRILL CO., Orrville, Ohio

Chicago Office: 419 Fisher Bldg.

New York Office: 1456 Hudson Terminal Bldg.

"Your Money Back" Protects You

THE cheap little car, fresh from the factory, looks spick and span, and seems to promise its buyer a great quantity of enjoyment, but—When that buyer gets his *next* car, he *does not* get one of those cheap little cars.

Why?

Not because he likes to spend more money.

But because he wants to *save* money.

• • •

Think that over.

It means something.

• • •

If a new car costs \$1500, and one year's repairs cost \$500, the price of that car is really \$2000.

If this \$2000 car is in the repair shop, getting fixed up, three days a month, its owner is losing one-tenth of its service, or \$200.

This car, therefore, stands its owner \$2200 the first year, although it cost only \$1500 to begin with.

• • •

And in using this cheap little car its owner never knows when something is going to break and leave him stranded miles from home.

Being a cheap car, it can't climb hills like a good car, it lacks the speed of a good car, it hasn't the size, style and beauty of a good car, and wherever the owner goes with it, it advertises him as a *cheap* buyer.

That's why no man ever buys one of these cheap little cars a *second* time.

• • •

If a car isn't worth buying a second time, it *isn't worth buying at first*.

And the buyer who recognizes that fact before he buys any car at all, saves himself much expense, much disappointment, and much annoyance.

• • •

If you are planning to buy a motor car, read every word of this advertisement.

• • •

We have made motor cars continuously since 1896. Mr. Winton made and sold the first gasoline car produced in America. He has made and sold more first-class cars than any other single manufacturer. And we have on our books the names of men who have bought as many as six or eight of our cars. One buyer, Mr. L. R. Speare, president of the American Automobile Association, has owned and used 16 different cars of our manufacture.

It is because Winton cars are right in the first place—right in material, workmanship, power, style, beauty and cost—that once a man buys a Winton he will never be satisfied with any other make.

• • •

One reason why this is true is that the Winton car stands up under hard use with a smaller repair expense than any other car on the market.

Sworn testimony of 20 Winton owners (we send you their names and addresses upon application) show that 20 Winton cars travel 184,190 miles on \$142.43 repair expense.

That distance is more than seven times the distance around the earth at the equator.

And each car's average repair expense for 1000 miles is 77 cents.

That's a world's record that touches the pocket book of every automobile owner.

Compare that record with the expenses of the owners of other cars—right in your own neighborhood.

• • •

This wonderfully low expense record of Winton cars shows they are right in the first place—right in material, workmanship, power, quality, performance, right in everything that makes an automobile worth while.

• • •

And because they are right in the first place, Winton cars stand up longer than any other car on the market.

There are any number of Winton cars made as far back as 1900 still doing daily service in this country.

No other maker has a record to compare with the Winton record.

• • •

And because Winton cars stand up indefinitely, and run at less expense than other cars, it follows that a Winton car is always a good purchase, no matter how old it may be.

For the quality is in the car itself, and it stays there.

If the quality isn't in the car in the first place, you can't put it in.

And that's why the buyer of a cheap little car never buys one the same make a second time.

Because it depreciates so quickly that what little merit it originally possessed is soon gone, and the car is worthless.

• • •

We realize that there are many buyers who hesitate to put into their first car as much money as we get for our 1910 model—\$3000.

But we want the trade of these buyers just the same, because we know that once they become acquainted with Winton merit they will be the best salesmen for Winton cars we could get.

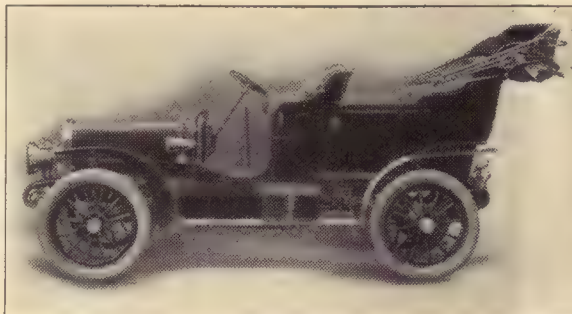
So we have devised a plan where the man who doesn't want to spend \$3000 can still get a Winton car, and be in the class of first-grade buyers and satisfied owners.

• • •

This is the plan.

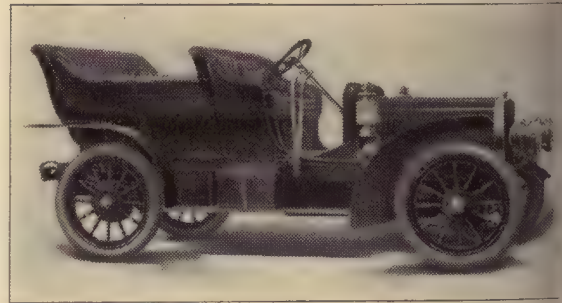
Some of our buyers want a new car every year—in order to have the very latest style of body, the latest thing in fancy trimmings and the like.

These buyers turn over their used cars in part payment for new cars.



WINTON MODEL K.

Four-cylinder, 30 H. P. motor. 4¾-inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Three brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4-inch tires. Wheel base 102 inches. Gasoline tank, 15 gallons. Five-passenger body. Original price, \$2500. Bargain price, \$500 to \$800.



WINTON TYPE X-I-V.

Four-cylinder, 30 H. P. motor. 4½ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual clutch transmission. Shaft drive. Semi-floating-type rear axle. Forged-steel front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on ball bearings. 34x4-inch tires. Wheel base 104 inches. Gasoline tank, 22 gallons. Five-passenger body. Original price, \$2500. Bargain price, \$700 to \$950.

From Mistake in Buying a Motor Car.

In the past it has been our custom to sell these used cars to city "just as they stand." But we have changed our policy—in order to get your trade.

We take these cars into our factory, replace worn parts, tune up to top-notch running condition, revarnish the body (sometimes an entirely new coat of paint), and offer this car to you at what it costs us.

This policy puts you in possession of a high-grade car at an exceptionally low price and makes you an enthusiastic advertiser of Winton.

And remember this: If you ever buy a Winton car from the Winton Motor Carriage Company, and it is not exactly as represented, we give you your money back without bickering or delay.

OUR MONEY BACK is something no other automobile maker makes. We make the proposition because we know we have the best skill and experience and facilities can produce.

Look over the bargains offered on this page. Pick out one that is best to you, and write us about it. This involves no obligation on your part whatever.

We will write you, describing the car in detail, tell you what it has in the way of top, glass front, speedometer, if any (some cars are sold without these equipments), and will make you a rock bottom price that will interest you.

And note this: You are not obligated in any way. We never ship a car to a prospect and try to force him to take it, when he has only asked for information.

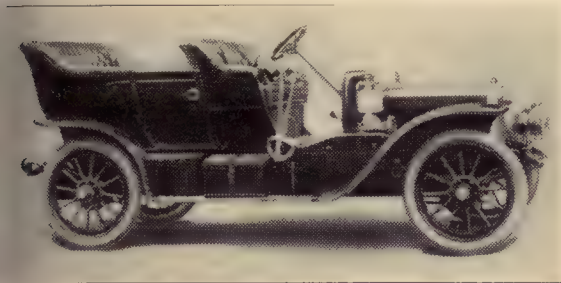
The Winton Motor Carriage Company doesn't do business that way. If after we have told you exactly what we have, you decide to look the car over, we will arrange for a demonstration before you put down a cent. Even then there is no obligation on your part. You needn't buy at all unless you are ready to buy and unless you are satisfied. And even if you do buy, remember we say: "Your money back if the Winton car is not as we have represented it."

Look over these bargains and write us today. We urge prompt action because our stock is limited and spring orders are generally more numerous than we can fill.

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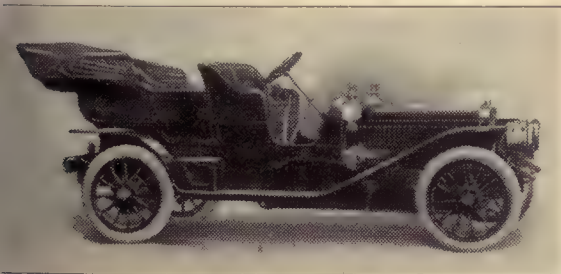
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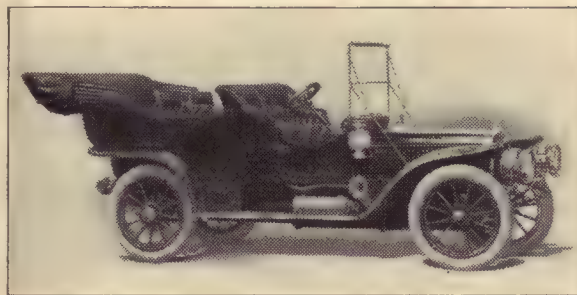
WINTON MODEL M.

Four-cylinder, 40 H. P. motor. 5 inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Multiple-disc clutch and four-speed selective-type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton twin springs. Best hickory wheels, running on roller bearings. 34x4½-inch tires. Wheel base 112 inches. Gasoline tank, 22 gallons. Seven-passenger body. Original price, \$3500. Bargain price, \$1100 to \$1400.



WINTON SEVENTEEN.

Self-cracking, six-cylinder Channel steel front axle, with 5-inch stroke. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magneto and storage battery. Mechanical force-fed lubrication. Multiple-disc clutch and three-speed selective type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating type rear axle. Channel steel front axle, with manganese bronze heads. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearing. 34x4½-inch tires in front, 34x4½ tires in rear. Wheel base 120 inches. Gasoline tank 32 gallons. Five-passenger body. Original price, \$3000. Bargain price, \$2000 to \$2500.



WINTON SIX-TEEN-SIX

Self-cracking, six-cylinder, 48 H. P. motor. 4½ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magneto and storage battery. Hancock mechanical oiler. Multiple-disc clutch and three-speed selective-type transmission. Clutch and transmission run on ball bearings. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 36x4½-inch tires. Wheel base 120 inches. Gasoline tank, 22 gallons. Seven-passenger body. Original price, \$4500. Bargain price, \$1600 to \$2000.

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FOWLER, COLORADO.

Fowler, Colo., is in the heart of the Rocky Ford district, located eighteen miles from the city of Rocky Ford, and thirty-eight miles from Pueblo, in the Arkansas Valley. In the matter of water for domestic purposes Fowler is particularly fortunate, having an abundant supply of pure soft water. Fowler has two trunk line railroads—the Santa Fe and the Missouri Pacific. The population is about 1,500.

An active commercial club is about to inaugurate a campaign to force the attention of the land seeker to the exceptional advantages to be enjoyed in this vicinity. Lands under the Oxford and High Line ditches, in operation for a number of years, are worth \$200 to \$600 per acre, producing from \$200 to \$400 per acre per season in fruit. A large system of new reservoirs is being constructed near Fowler, where land is now held at exceptionally low values. Water can now be supplied to much of the land and all will soon be available for cultivation.

The old irrigated district comprises about 13,000 acres. Fruit culture has been very successful, smudging not necessary, and alfalfa, cantaloupes and sugar beets have brought in fortunes to the settlers.

The Fowler of today has a splendid High School, good church advantages, no saloons, two substantial banks, more than 300 days of sunshine each year, over 12,000 feet of concrete sidewalk, a postoffice business of over \$30,000 annually, and an annual mercantile business of \$500,000. It is surrounded by the most productive farm lands in America, and has a good ready market for all farm products. Its shipping business amounts to more than \$175,000 annually in the way of receipts to the Santa Fe Railroad alone.

Six years ago Fowler had only 200 people and was but a mere spot on the plains.

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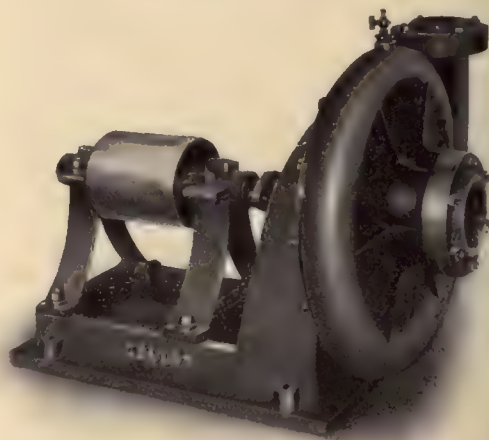
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Supreme Court Decisions

Irrigation Cases

DAMAGE BY OVERFLOW FROM DITCH.—

An owner of property adjoining an irrigation ditch could not recover damages for overflows caused by his own act in restricting the size of the ditch and in lowering the banks.—*Malmstrom v. People's Drain Ditch Co.* Supreme Court of Nevada. 107 Pacific 98.

APPROPRIATION.—

Where an irrigation ditch was completed within four years from the commencement thereof, it was within a sufficient time, in view of the difficulties encountered in its construction.—*Whited v. Cavin.* Supreme Court of Oregon. 105 Pacific 396.

SALE OF PERCOLATING WATERS.—

The rights of owners of land overlying a water-bearing artesian stratum to withdraw and use the waters are correlative, so that one may not divert such waters for sale elsewhere to the injury of others.—*Miller v. Bay Cities Water Co.* Supreme Court of California. 107 Pacific 115.

RIPARIAN RIGHTS.—

The damming of a stream, navigable a portion of the year, to create artificial freshets for the purpose of floating logs, may be restrained where the banks of the stream are thereby washed, to the injury of the adjacent landowners.—*Flinn v. Vaughn.* Supreme Court of Oregon. 106 Pacific 642.

USE OF WATER.—

Where an appropriator of water has a decreed priority of the waters of a stream for use of his whole property, which abuts on both sides of the stream, he may use the whole amount of the water decreed on the property on one side of the stream.—*Diez v. Hartbauer.* Supreme Court of Colorado. 105 Pacific 868.



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Let me send you FREE, a copy of our thirty-two page book devoted exclusively to the Agricultural and the Horticultural resources of this section of Colorado and Wyoming along our lines. This book is illustrated with twenty-seven different scenes and describes the present condition fairly and thoroughly. It also gives personal testimony of a few farmers, taken at random, from different valleys that may be cited as the typical results of successful and profitable farming in this section.

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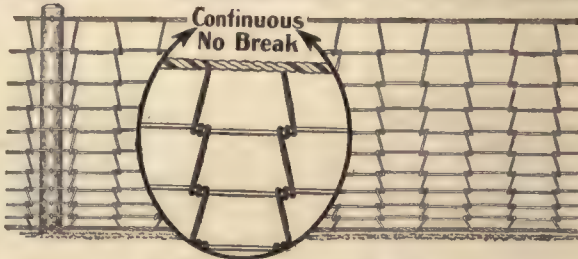
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At the present writing, May 21st, we have under construction eight dams as follows:

A dam 45 ft. high and 700 ft. long in Newfoundland; a dam 48 ft. high and 900 ft. long in Georgia; a dam 48 ft. high and 470 ft. long in Wisconsin; two dams respectively 54 ft. high and 450 ft. long, and 60 ft. high and 550 ft. long in Minnesota; a dam 86 ft. high and 680 ft. long in Oregon and three smaller dams in Maryland, Indiana and Kentucky respectively. Seven of these dams include a power house in the bulkhead of the dam. The time of construction on each will be about eight months with the exception of the Oregon dam which will require about a year.

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An offer for the farmer who wants the best fence produced at the lowest price a life-time fence can be made for. Advance Fence isn't just a boundary line. It stands for system and advanced value in property. Any farmer who subdivides his land into plots for crop rotation is systematizing his farm business. A built-to-last, sound-value, substantial-looking fence means to the owner of the land, and every man who works on it, exactly what a modern, substantial factory or office building means to every man doing business in the building.

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What the farmer puts money and protection into, he's going to get money and protection out of.

Advance Woven-Wire Fence is the best looking, strongest constructed, longest lasting fence on the market. To prove it, we make our great offer. If the fence isn't O. K. to you, and more, send it back at our expense.

We sell to you direct—no middleman—therefore the price is right—one profit only after making.

Advance Fence is made of Solid Wire, not wire cut and spliced again. A cut wire weakens. Our stay wire is continuous, woven in with the main top and bottom wire running the entire width of the fence from one stay to the next. Made of the best basic, open-hearth steel, galvanized with a heavy coat of 99-per-cent-pure spelter—that means rust proof.

Advance Fence always stays taut—straight and handsome. Prove it for yourself. Write to us for all particulars. Remember, we pay freight and guarantee safe delivery. Don't pay two prices—Write us today.

ADVANCE FENCE CO., Box 123 Elgin, Ill.

FORFEITURE OF WATER RIGHT.—

That under a contract whereby defendant granted water rights to plaintiff, such rights to be forfeited on plaintiff's failure to complete certain work within a stated time, plaintiff expended in the work large sums for which it would obtain no equivalent in case of forfeiture was not ground for relieving against the same; defendant not being in fault, and its damages being difficult to estimate.—*Farmers Pawnee Canal Co. v. Pawnee Water Storage Co.* Supreme Court of Colorado. 107 Pacific 286.

RIGHT TO SUPPLY OF WATER.—

Where defendant irrigation company was a party to a statutory proceeding before the county commissioners in which the rate for water was fixed, the adjudication of the board cannot be collaterally attacked by it in mandamus to compel it to furnish water for a certain season at the rate fixed by the county commissioners; the decision of the commissioners being conclusive till judicially overturned on a direct attack.—*Northern Colorado Irr. Co. v. Pouppirt.* Supreme Court of Colorado. 108 Pacific 23.

CONTRACT RIGHTS.—

Where the rights of persons to the use of the water of a stream for irrigation in certain quantities and at certain times are not based on their original appropriation, but on a contract between themselves, neither is entitled to increase his irrigated acreage after the date of the contract so as to use more water than he was actually, beneficially, and necessarily using at the time of making the contract.—*Quirk v. Rich.* Supreme Court of Montana. 107 Pacific 821.

DIVERSION FROM UNDERGROUND STRATUM.—

An owner of land overlying an underground saturated stratum, receiving its supply from a stream or saturated plane, is entitled to enjoin the diversion of the waters of the stream or saturated plane, or other well-defined supply, for use elsewhere than on lands to which, as waters of the stream, they are riparian, or which, as waters of an underground stratum, they may be reasonably and usefully applied to the overlying land.—*Miller v. Bay Cities Water Co.* Supreme Court of California. 107 Pacific 115.

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The latest development in labor machinery is the **HART-PARR GAS TRACTOR**, which is revolutionizing farming methods. They displace many men and more horses, and are always ready for service and eat nothing when standing idle. Think what it means to have cheap power and plenty of it, always at your command. You can use these Tractors for plowing, discing, seeding, harvesting, threshing, hauling, hay baling, feed grinding, running irrigating pumps—in fact, all kinds of heavy farm work.

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PREFERENTIAL RIGHTS.—

A water company having water appropriated under Const. 1879, art. 14, § 1, for sale, rental, or distribution, the use of which is thereby declared to be a public use, cannot confer any preferential right on one consumer over another to the use of any part of its water.—*Leavitt v. Lassen Irrigation Co.* Supreme Court of California. 106 Pacific 404.

NAVIGABLE WATERS.—

In an action by an abutting landowner to restrain the maintenance of a dam to create artificial freshets for floating logs, it is no defense that this method of floating the logs is less injurious to plaintiff's land than to float them without thus raising the water.—*Flinn v. Vaughn.* Supreme Court of Oregon. 106 Pacific 642.

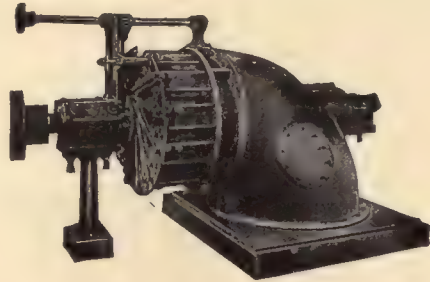
IRRIGATION CONTRACTS.—

Private contracts between an Idaho irrigation company and landowners, granting water rights at fixed prices, made in good faith prior to Act Idaho March 7, 1895 (Acts 1895, p. 174), enacted pursuant to article 15 of the state Constitution, which contracts were valid when made, were not affected by such act or subsequent legislation, and remain valid and enforceable.—*Boise City Irrigation & Land Co. v. Turner.* U. S. Circuit Court, District of Idaho. 176 Federal 373.

RIGHT TO MAINTAIN IRRIGATION DITCH.—

Where defendant had owned, maintained, and used an irrigation ditch over the premises in controversy for a period longer than the statute of limitations prior to plaintiff's occupancy, defendant could maintain the ditch in its present location and have water flow through the same to the extent of its capacity or in the volume contained in the ditch during the years defendant used it.—*Malmstrom v. People's Drain Ditch Co.* Supreme Court of Nevada. 107 Pacific 98.

SAMSON TURBINE



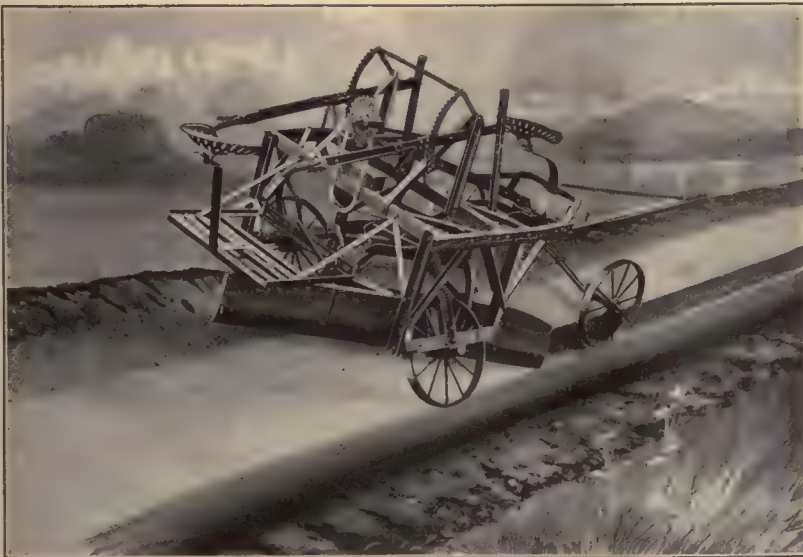
When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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A New, Light Ditch Plowing Machine, Especially Designed for Cutting Small Laterals on Irrigated Farms, and Ditching and Grading Roads.

This type of machine cuts ditches for less money than any other tool or machinery, because it plows the dirt out of the ditch with one continuous motion, whereas all other ditching machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling landsides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

EVERY IRRIGATED RANCH OR FARM NEEDS ONE OR MORE OF THESE MACHINES. IT WILL QUICKLY PAY FOR ITSELF. SEND FOR DESCRIPTIVE FOLDER AND LET US TELL YOU MORE ABOUT IT

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GRANT OF WATER RIGHT.—

In such case the contract conveys a free and unincumbered right and title in and to the waters of the canal, and carries with it an unqualified right to the extent of the quantity of water conveyed in the appropriation itself and the right to have the water flow through the canal, and the grantor perpetually abandons and foregoes the right to ever thereafter charge, collect, or realize any profit or rental for the use of the water conveyed.—*Nampa & Meridian Irr. Dist. v. Gess.* Supreme Court of Idaho. 106 Pacific 993.

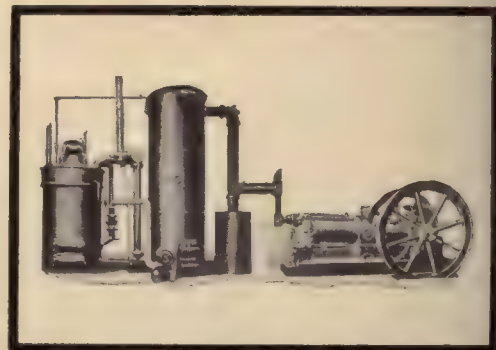
GRANT OF WATER RIGHT.—

Where a landowner conveys a tract of land lying under his canal and susceptible of irrigation therefrom, and includes in the conveyance a grant of the "free and perpetual use of water" from the grantor's canal sufficient to irrigate the land conveyed, *held*, that the grant of such free and perpetual water right does not obligate the grantor or his successors or assigns to perpetually bear and pay the expense and cost of maintaining and protecting the canal and the water right and delivering the water to the consumer.—*Nampa & Meridian Irr. Dist. v. Gess.* Supreme Court of Idaho. 106 Pacific 993.

PERPETUAL WATER RIGHT.—

A purchase of a perpetual water right from an irrigation company with the right to receive the water so purchased from the company's canal carries with it such a right in the appropriation itself and such an easement or servitude in the canal system as to authorize and enable the purchaser himself to go upon the property and protect the appropriation and maintain the diversion, and repair the canal, and carry the water through the canal system to the extent of the purchaser's water right, in the event the company fails, neglects, or refuses to do so.—*Idaho Fruit Land Co., Limited, v. Great Western Beet Sugar Co.* Supreme Court of Idaho. 107 Pacific 989.

(Continued on page 398.)



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The most serious drawback to the GENERAL use of gas power has been the comparatively high price of illuminating gas and gasoline, except where natural gas is available.

To overcome this objection several devices for producing gas have been brought on the market.

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The Otto Suction Gas Producer is designed from the combined experience of the seven Otto factories all over the world.

We use mainly the German ideas modified to meet the special conditions existing in America.

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(Continued from page 372.)

content and purity of juice those of any other state. These are facts gathered from the statistics of the United States Department of Agriculture.

An average yield in this county is 20 tons per acre and the price is uniform at \$5.00 per ton at the loading point on the railroad. It is estimated that the cost per acre to raise and deliver the beets to market is \$35.00, which leaves a handsome profit to the grower.

The cut shown on page 372 of a cauliflower grown on the farm of Capt. French near this tract, illustrates the size and quality of the vegetables grown. This is not a freak sample, but one of a large number grown in his garden for home use.

Mr. Chase, living near Capt. French, raised and sold from a plat of 6 acres planted to different varieties of vegetables, \$1,800 in the season of 1909. There is a good market for all the vegetables that can be raised in the cities and mining camps in and adjoining Colfax county.

The principal commercial fruit crop is the apple, although excellent yields of pears, cherries, plums and all the small fruits are obtained. The apple has been grown here fully equal in quality and yield to the most famous apple districts of the West and the Antelope Valley is a thoroughly proven apple district. Orchards that have been planted from 15 to 35 years show an average yield over and above all expenses, which include boxing and freight as well as the care and cultivation of the tree during the spring and summer seasons, of from \$250 to \$400 per acre. An uncommon feature of the apple industry in this valley is that during the long period of years that the apple has been grown here a wormy apple is unknown and the apple grower has not been compelled to spray as is common in every other district. Neither does he have to guard against frost. This seems to be a natural home of the apple and there is no doubt that the future of this valley so far as the growth of apples is concerned will be fully equal to other famous districts of the United States.

The new settlers on the French tract have planted about 300 acres to apples this season, which shows their belief in this important industry.

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Near Pueblo That Can Be Irrigated ?

Look at the cheap land bargains **NOW** before Irrigation Congress meets at Pueblo in September. Just send your name and address—we will send the information free.

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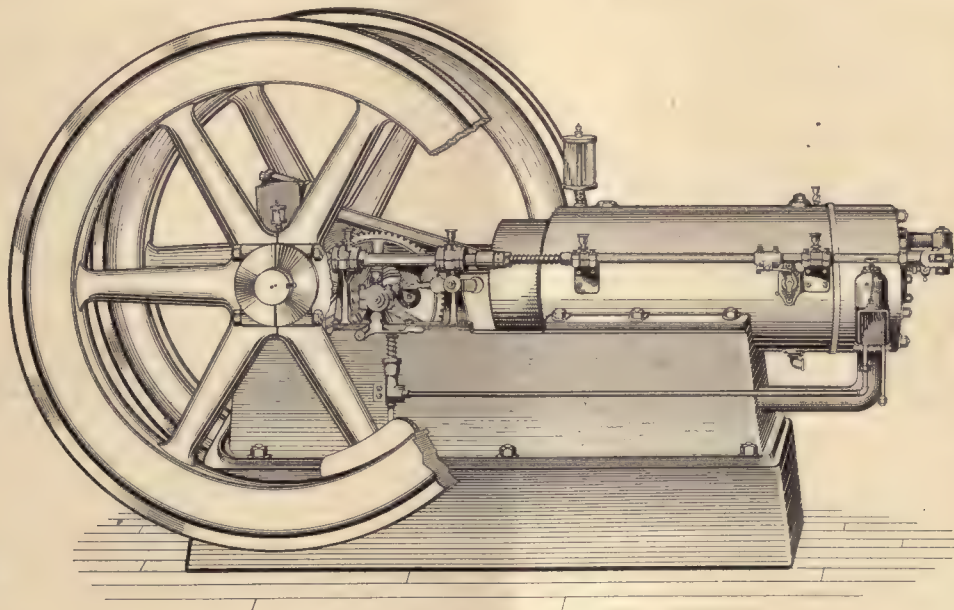
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(Continued from page 396.)

FORFEITURE OF IRRIGATION RIGHTS.—

Where a grantee of public land for an irrigation reservoir site failed to complete his improvement for five years, as required by Act Cong. March 3, 1891, c. 561, 26 Stat. 1095 (U. S. Comp. St. 1901, p. 1535), so that the same was subject to forfeiture under section 20, it was not necessary to the enforcement of a forfeiture that it should be first declared by act of Congress, but a forfeiture could be enforced by the executive in judicial proceedings.—*United States v. Whitney*. U. S. Circuit Court, District of Idaho. 176 Federal 593.

RECLAMATION LANDS NOT R. R. RIGHT OF WAY.—

Lands within a reservation withdrawn under the reclamation act (Act June 17, 1902, c. 1093, 32 Stat. 388 [U. S. Comp. St. Supp. 1909, p. 596]) for the furtherance of an irrigation project and resting under valid, subsisting homestead filings are no longer "public lands," and are therefore exempt from the operation of the railroad right of way act (Act March 3, 1875, c. 152, 18 Stat. 482 [U. S. Comp. St. 1901, p. 1568]), granting to railroad companies rights of way through the public lands of the United States.—*United States v. Minidoka & S. W. R. Co.* U. S. Circuit Court, District of Idaho. 176 Federal 762.

JUNIOR AND SENIOR APPROPRIATIONS.—

Where a person has the first priority on a stream, taking water out at the lowest point therein, it is not necessary that junior appropriators up the stream must, at all times and under all conditions, let sufficient water flow past their headgates to supply that priority, though the senior appropriators may lawfully demand that he have at his headgate sufficient water for his present needs, but if that result is obtained through return waters after first use by the junior appropriators up the stream, the senior appropriator cannot complain.—*Vogel v. Minnesota Canal & Reservoir Co.* Supreme Court of Colorado. 107 Pacific 1108.

FORFEITURE OF RESERVOIR SITES.—

Act Cong. March 3, 1891, c. 561, 26 Stat. 1095 (U. S. Comp. St. 1901, p. 1535), authorizing the grant of public land for reservoir sites, section 20 provides that, if any section of the canal shall not be completed within five years after location, the rights granted shall be forfeited as to any uncompleted section of the canal, ditch or reservoir. *Held*, that such requirement being in the nature of a condition subsequent, a failure to comply did not ipso facto operate to divest the grantee of title and revert it in the government, but that, to be effectual, the default must be followed by a declaration of forfeiture by some competent authority, and, the grant being of a public nature, the declaration can only be by act of Congress or in an appropriate judicial proceeding.—*United States v. Whitney*. U. S. Circuit Court, District of Idaho. 176 Federal 593.

CONTRACT TO SUPPLY WATER.—

Under a contract by which a stream of water measuring four cubic feet per second of time flowing through a canal was to be supplied, and, if needed between certain dates each year, the water was to be supplied from such water as could be lawfully got in the canal or in a reservoir, the maximum quantity to be drawn from the reservoir not to exceed one twenty-fifth part of the total amount of water that would be in the reservoir each year, where the water which could be lawfully got in the reservoir was that which came to the headgate of a certain ditch, and the water which could be lawfully got into the canal was the accretions and seepage from the reservoir and a river, the maximum quantity to be drawn from the water coming to the headgate of the ditch could not exceed one twenty-fifth part of such water.—*Great Western Sugar Co. v. White*. Supreme Court of Colorado. 108 Pacific 156.

RECLAMATION ACT.—

Reclamation Act June 17, 1902, c. 1093, § 4, 32 Stat. 389 (U. S. Comp. St. Supp. 1909, p. 598), provides for the establishment of reclamation projects to be paid for by entrymen of the land, and section 6 authorizes and directs the Secretary of the Interior to use the reclamation fund for the operation and maintenance of reservoirs and works constructed under the act, provided that, when the payments are made for the major portion of the lands irrigated from the waters of any of the works, then the management and operation thereof shall pass to the owners of the land to be maintained at their expense, provided that the title shall remain

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in the government until otherwise provided. *Held*, that the Secretary of the Interior, being authorized to tax and determine the charges, was authorized to divide the same into two parts, one for construction, and the other for maintenance and operation; and hence he was authorized to impose reasonable assessments on land irrigated prior to the time when payment of the major portion of the cost of construction had been made, and the works passed under management of the owners of the irrigated lands.—*United States v. Cantrall*. U. S. Circuit Court, District of Oregon. 176 Federal 949.

OPPRESSION BY WATER COMPANY.—

The conclusion that defendant water company was guilty of malice and oppression in failing to furnish water to plaintiff for irrigation, making it liable for exemplary damages, is authorized by evidence that its general manager told him not to put in a side gate to receive water from its ditch; that its directors had notified him to tell plaintiff that they would not give him any water for that land, and that plaintiff knew why; that its president told him its directors were bitter towards him because of the condemnation proceeding for its right of way, and that it would furnish him no water till plaintiff paid back the damages he received in that proceeding, and while he was occupying with his ditch a portion of its right of way; and that no attention was paid to his written demand for water which he left with the person in charge of its office, at the same time making tender of water rates, as defendant had, and must have known it had, no right to insist on such matters as a condition precedent to furnishing water.—*Lowe v. Yolo County Consol. Water Co.* Supreme Court of California. 108 Pacific 297.

(Continued from page 354.)

\$2,000,000; dairy products, \$2,200,000; sugar beets, \$1,900,000; cereals, \$8,000,000; horticultural products, \$1,700,000; salt products, \$165,000, making a grand total of \$75,000,000, and yet the development of her resources have only begun, for example experts have estimated that the coal fields of Utah contain over two hundred billion tons of coal, one county alone contains more coal than the state of Pennsylvania. The iron fields are the largest in the world. She stands third in her copper deposits. Surely Utah offers an inviting field to all.

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What wonderful memories surround the word home, "Home, sweet home, be it ever so humble there is no place like home." But, my brother, have you a home of your very own? Let me tell you something. Out in the valleys of Utah there is being provided for you an opportunity to secure a home, a home on a sure foundation, where the crops never fail, where the climate is healthful and the sun shines nearly every day in the year, pure water to drink and plenty to irrigate with, good markets, railroads, schools, churches, and good people to associate and neighbor with.

Perhaps you may say I am a stranger to this wonderful country. What additional assurance have I, if I should come out there to investigate that I would find things as you say? In answer to these questions let us say that Mr. I. B. Perrine, of Twin Falls, Idaho, has become interested in irrigation in Utah. Mr. Perrine is the father of the Twin Falls country. He, more than any other man, is responsible for the millions of acres that are being reclaimed in Idaho. He, when all others grew discouraged, pushed forward realizing that he was on the sure foundation, and today, as the result of his labor, thousands of happy and prosperous farmers are reaping a sure reward. Mr. Perrine and his associates have interested themselves in the Sevier River Irrigation Project in Utah, believing it to be a good thing, something they could recommend to their friends. All eyes are being turned towards Utah and no doubt 1910 will see a tremendous influx of people looking for homes and investments and they will not be disappointed.

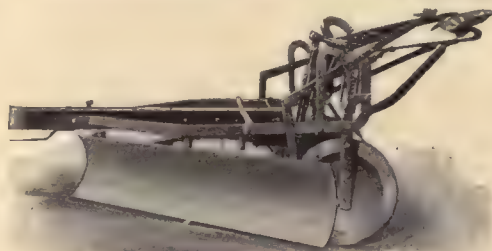
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Decisions of the Department of the Interior and of the Public Land Office

Public Land—Aggregate Area—Approximation—Act of August 30, 1890.

A homestead entry for forty acres, made by one who had heretofore acquired title under the public land laws to 288.17 acres, allowed to stand, under the rule of approximation, notwithstanding the provision of the act of August 20, 1890, that no person shall be permitted to acquire title to more than 320 acres in the aggregate under all the public land laws.

Price of Land Within Granted Limits of Railroad.

Under date of November 27, 1909, in the case of Walter Hollensteiner (38 L. D. 319), the department held that lands within the granted limits of a railroad, but excepted from the operation of the grant for any reason, are "double minimum lands," as provided by Section 2357, U. S. Revised Statutes, fixing the price of such lands at \$2.50 per acre. U. S. land officials will be governed by said decision in disposing of all such lands (both odd and even sections), and in the collection of commissions thereon.

This decision will not affect the price of land in reservations within said granted limits, opened under special acts of Congress, passed after the date of definite location of the road, when from said acts, or from an Indian treaty, it is apparent that Congress intended that a price, other than that fixed by Section 2357, R. S., should be collected.

Desert Land Entry—Reclamation Withdrawal—Delay—Section 5, Act of June 27, 1906—Gustave Gilbertson—March 3, 1910.

Where a government reclamation withdrawal interferes with and results in the abandonment of a private co-operative irrigation enterprise, a desert land entryman interested in such enterprise and prevented by the abandonment thereof from continuing his improvements and submitting proof within the time fixed by law, is within the act of June 27, 1906, and is entitled to an extension of time under its provisions.

Relinquishment—Death of Entryman—Wilson v. Holmes et al—March 3, 1910.

A homestead entry by one who purchased the improvements and relinquishment of a prior entryman will not be

canceled to reinstate the former entry, in the absence of fraud or bad faith, merely because the relinquishment of the former entry was filed after the entryman's death.

As between the parties a sale of improvements and relinquishment of an entry is a valid contract, and though it conveys no right as against the United States, it is obligatory on the entryman and his heirs, and the equity of the purchaser to make entry may properly be recognized if exercised promptly and prior to the intervention of any adverse right.

Reclamation—Water Right—Mortgage—Sale Under Foreclosure—Instructions—March 5, 1910.

Whenever in case of foreclosure of a mortgage given to secure a loan on land in private ownership for which charges are payable for a water right under the reclamation project, the mortgagor buys in the land, no steps will be taken to cancel the water right application on account of failure to maintain residence upon, or in, the neighborhood of the land, until the expiration of one year from the date of the foreclosure sale; provided that all charges that may be due or that may accrue during such interval be paid, and also that within such period of one year, a water right application for such land be filed by a qualified person who, upon submitting satisfactory evidence of transfer of title, shall be entitled to a credit equal to all payments theretofore made on account of the water right charges for said land.

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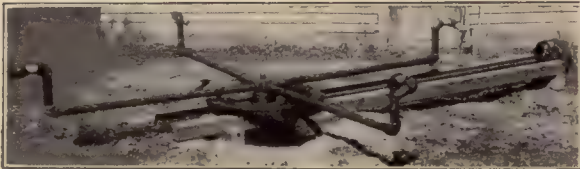
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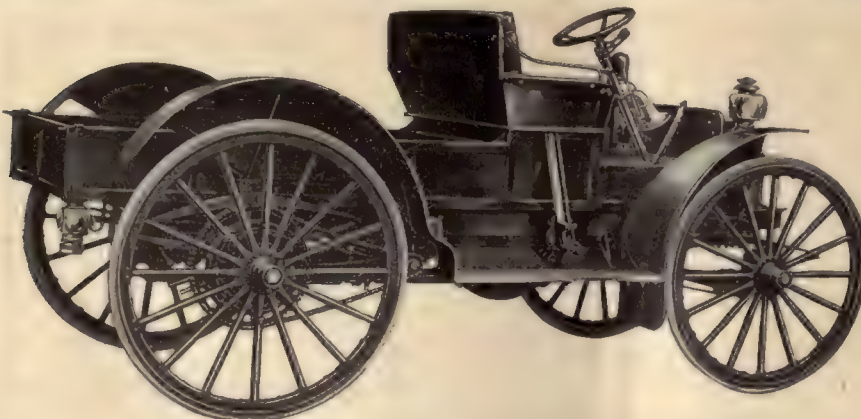
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TWENTY-EGHT-HOUR LAW.

Department of Agriculture to Bring Test Cases as to Space for Live Stock in Cars.

Controversy has arisen between some of the railroads of the country and the larger live stock shippers in regard to the space in the cars for animals in transit from one state to another in order to make unloading unnecessary and still comply with the twenty-eight-hour law. This law provides that when animals are carried in cars "in which they can and do have proper food, water, space and opportunity to rest" that they shall not be required to be unloaded. The Department of Agriculture has been appealed to by both railroads and shippers, and today the position of the department is tentatively announced as follows:

If cars are not loaded beyond the minimum weight fixed by the tariffs, the department will not, for the present, raise the question as to whether sufficient space is provided for the animals to rest; but railroads which load beyond the minimum and do not unload for rest will have to take their chances of prosecution in the courts.

It is the intention of the department to institute a number of test cases and secure rulings from the federal courts as to what space must be afforded. It is claimed by the department that this is the only course open, since no power is given the Secretary of Agriculture by the law to make rulings and regulations regarding space to be afforded in cars.

In all cases where live stock is not unloaded en route "into properly equipped pens for rest, water and feeding" the cars must be provided with facilities for feeding and watering in transit, and live stock must, when so fed and watered, receive proper feed and water.

"Colorado's Horticultural Inspection Law and Methods for the Control of Insect Pests and Plant Diseases," is the title of Circular No. 1, from the office of the Colorado State Entomologist.

Those interested in Colorado's horticultural inspection law, and the remedies that are recommended for some of the worst orchard insects and diseases, can obtain copies of this bulletin by requesting them of Prof. C. P. Gillette, State Agricultural College, Fort Collins, Colo., as long as the supply lasts.

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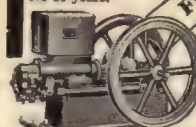


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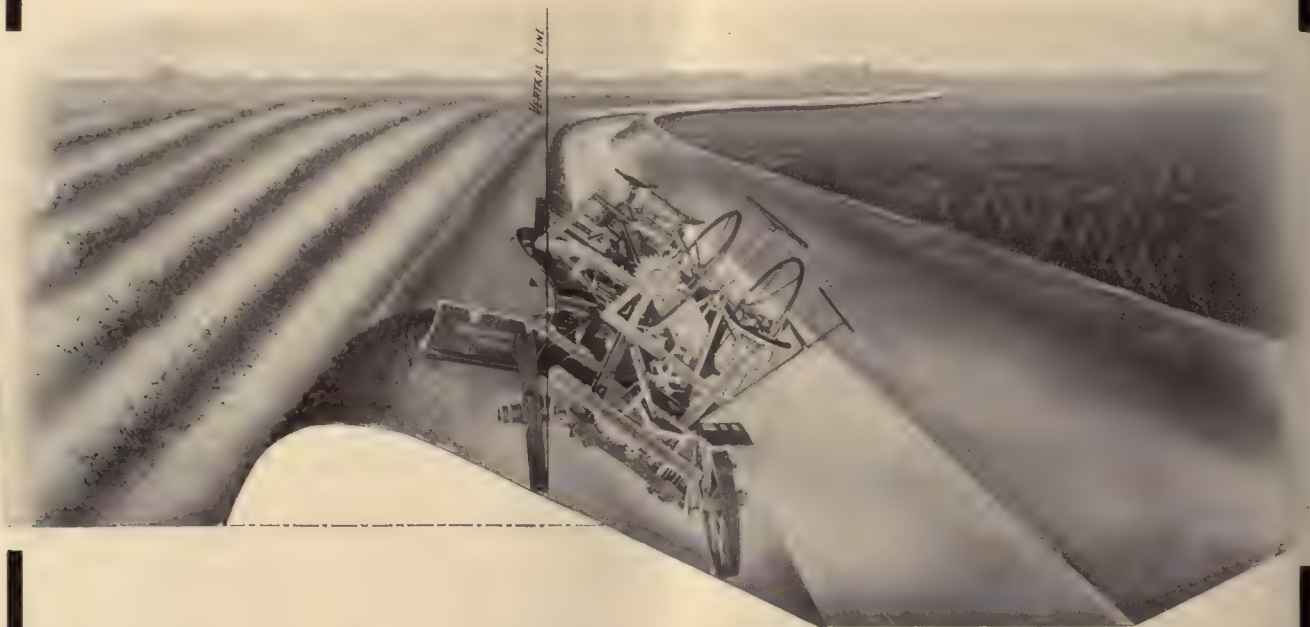


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NEW MEXICO RANGE CATERPILLAR.

A new range caterpillar which was reported as damaging the ranges in New Mexico has been investigated by the representative of the United States Department of Agriculture, and a report of those observations has just been issued in Bulletin 85, Part V, Bureau of Entomology.

The first intimation of the alarming increase of *Hemileuca* caterpillars in northeastern New Mexico reached the department in August, 1908, and before the end of October of that year the outbreak was under the careful study of an expert. Therefore, the report covers the adult period of this depredating insect in 1908, and the entire active life period in 1909.

The history of the range caterpillar, now designated as *Hemileuca oliviae* Cockrell, prior to this outbreak, is very vague and probably, owing to the fact that they have not been able to distinguish between these caterpillars and those of other species, the information furnished by ranchmen and others is very unreliable. The species may have had its origin in the country east and adjacent to the Rocky Mountains in northeastern New Mexico. The first authentic history of the genus *Hemileuca* in New Mexico begins about five or six years ago, and the section around Springer Lake, an irrigation reservoir a few miles from Springer, a station on the Santa Fe Railway, fifty miles south of the Colorado line, appears to have been the starting point of the present outbreak, and from there it has spread north, east and south.

The area at present is not well defined, but it is known to extend from just north of Las Vegas, N. M., on the south, to Las Animas, Colo., on the north, and from Cimarron and Kochler, N. M., on the west, to points within the Texas "Panhandle" on the east—or over an

area 200 miles from north to south by 150 miles from east to west—comprising about 30,000 square miles.

All of this area is not evenly infested, but the insect is more or less prevalent everywhere. Counts made at widely distant points of the caterpillars present on a measured square rod showed enormous numbers present on this range, in some cases as high as 20,000,000 to the square mile, justifying, as conservative, an estimate of 1,536,000,000 caterpillars depredating on the infested area. A number capable of tremendous possibilities for harm, especially when it is remembered that the full-grown larvae frequently measures $2\frac{1}{2}$ inches in length, with the diameter of a man's index finger, and are so numerous that one really has to choose his steps to avoid crushing the huge, spiny, ugly caterpillars. And the sensation produced when it becomes necessary to walk miles through their myriads is both peculiar and lasting.

The bulletin treats fully of the identity, life history, natural enemies and remedial measures, and states that further observation and study will be necessary before it can be determined whether the species will retain its foothold in adjacent states to the south and east and continue to spread, or whether, owing to high altitude and consequent atmospheric and meteorological conditions, it will be restricted to the particular section of the country now infested.

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ASPINWALL MANUFACTURING COMPANY, 110 Sabin Street, JACKSON, MICHIGAN, U. S. A.

Canadian Factory, Guelph, Ontario

World's Oldest and Largest Makers of Potato Machinery



A SATISFACTORY WATER SUPPLY

ALWAYS PAYS DIVIDENDS

A Humphryes' Hydraulic Ram will furnish you, when installed, with a permanent and automatic water supply. Why spend money on costly pumping plants and time, strength and expense in operating same, when a Hydraulic Ram will lift your water and deliver it with absolutely no expense. The Humphryes' Pneumatic System will supply your residence with water under pressure for all domestic purposes and give service heretofore obtainable only with an elevated tank or direct connection with municipal water works. Our New Catalog "Domestic Water Supplies" tells you all about the HYDRAULIC RAM and PNEUMATIC SYSTEM and will be mailed you upon request.

THE HUMPHRYES MFG. CO.,
MANSFIELD, OHIO

The U. S. Government is Spending Millions of Dollars Annually to

RECLAIM the WET Lands by DRAINING CONVERT the DRY Lands by IRRIGATING



For the "LAND'S SAKE!" when are you going to Drain or Irrigate that farm of yours? You don't need a surveyor. Get a **BOSTROM IMPROVED FARM LEVEL** and do the work yourself. Simplicity, Accuracy, Durability, Guaranteed. **This Level is no makeshift.** It has Telescope with Magnifying Lenses, enabling you to read the Target a quarter of a mile away; and is used and endorsed in every State in the Union. **Satisfaction guaranteed or your money back.** Shipped on receipt of price, \$15.00, or, if preferred, will ship C. O. D. subject to examination. Outfit includes Level, Tripod, Graduated Rod and Target, full instructions and a copy of Bostrom's Book "Soil Salvation" of 25 years experience in draining and irrigating. Send your order TODAY to —

BOSTROM-BRADY MANUFACTURING CO., 1119 Pine St., St. Louis, Mo.

When writing to advertisers please mention The Irrigation Age.

Some Interesting Facts About Overlands

Our 800 dealers now are selling over \$200,000 worth of Overlands daily. That's a far larger sale than was ever attained by any other car in the world.

Some of the Users

The government is one of the Overland users. For a year and a half some of these cars have been used in carrying the mails. For 500 days they have made their regular trips, winter and summer, without a moment's delay. Each of these cars has done the work of three horse-drawn vehicles.

The J. I. Case Threshing Machine Company some time ago supplied 25 Overland cars to their country salesmen. They report that one man with one of these cars can do two salesmen's work.

The Altman & Taylor Machine Co. have also begun to supply Overlands to their salesmen.

We have recently built delivery car bodies on 900 Overlands for the use of storekeepers who want them for use as light delivery cars.

All Due to Simplicity

All these new uses for Overlands are due to their utter simplicity. A novice can run one as well as an expert.

The operation of the car is by pedal control. One goes forward or backward, fast or slow, by simply pushing pedals. The hands have nothing to do but steer.

Overlands are almost trouble-proof. The usual complexities have been avoided. One of these cars has been run 7,000 miles, night and day, without stopping the engine.

A child can master the car in ten minutes. Any member of the family can run it. And a car that

is relied on to carry the mails is the car which will always keep going.

\$3,000,000 Plants

Over \$3,000,000 has been invested to produce Overland cars in a perfect and economical way. The cars are made—as watches are made—by modern automatic machinery. Thus we get exactness to the one-thousandth part of an inch. And thus every part is made exactly like every other similar part. All parts are interchangeable.

Because of this machinery and our enormous production we are able to make cars for less than any one else.

This year we are selling a 25-horsepower car, with 102-inch wheel base, for \$1,000. We are selling a 40-horsepower Overland, with 112-inch wheel base, for \$1,250. And these prices include all lamps and magneto.

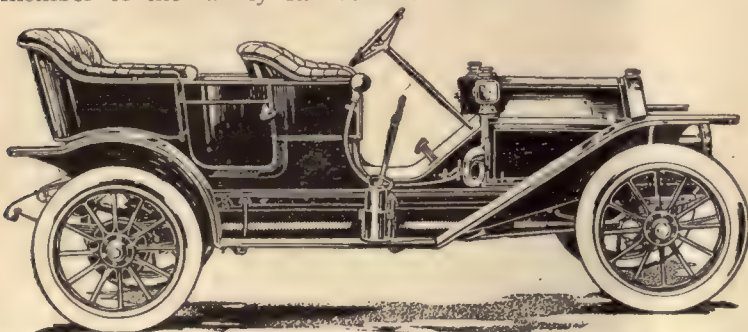
During the past year alone we have cut the cost of Overlands 20 per cent by multiplied production and this labor-saving machinery.

10,000 Tests

The various parts of each Overland car are subjected to 10,000 rigid inspections. Then every car, before it goes out, is given a long trial run on rough roads. One of our test roads includes the worst hill in Ohio.

Thus we know that each Overland is a perfect car before it leaves the shop. There are no mistakes.

Those are part of the reasons why Overlands have now come to outsell all other cars that are made. You will want the car which others want when you learn the facts. If you will send us this coupon we will mail you our catalog. We will also tell you the nearest place where you can see the cars.



The 25-horsepower Overland costs from \$1,000 to \$1,100, according to style of body. The wheel base is 102 inches. The 40-horsepower Overland costs from \$1,250 to \$1,500. All prices include five lamps and magneto.

The Willys-Overland Co. G 93

Toledo, Ohio

Licensed Under Selden Patent

Please send me the catalog free.

Are You Paying Too Much to Irrigate by Pumping?

Every irrigator knows his greatest expense is cost of water. But if you are irrigating by pumping, have you reduced the cost to the minimum? **Saving in pumping expense counts as much for profit as increasing the yield per acre.**

In any location where, mounted either horizontally or vertically, the pump can be placed close to the water supply, the

"American" Centrifugal Pump

will develop higher efficiencies than any other type of pump except the compound plunger pump connected to a compound condensing engine with Corliss valves. But a plunger pump equipped in this manner is **mighty expensive** to install, will require many times as much expense for **attendance** and, owing to its complicated mechanism, will require many times as many **repairs**.

Figure all these expenses for a period of years and the "American" Centrifugal will prove the more economical installation in every instance.

All centrifugal pumps look much alike from the outside but differ materially in interior construction, and it is the design of the water-ways and refinement of the flow-lines that are the most important features of the pump.



All the Gold Medals given to centrifugal pumps at the Alaska-Yukon-Pacific Exposition at Seattle in 1909 were awarded to **"American" Centrifugals** for the reason that the **flow-lines** were refined to a degree that the judges were compelled to recognize their superiority.

In the "American" Centrifugal there is no sudden change of direction of water in passing through the pump—just an easy forward flow in curves of constantly increasing radius and the impeller is adjusted to the casing with precision, preventing back-flow.

These features give "American" Centrifugals efficiencies of 60 to 80 per cent under actual working conditions and they are guaranteed to more than equal the best performance of any other pump of their type.

But it is not only in efficiencies, but cost of maintenance and repairs, that "American" Centrifugals excel. The main bearings are oiled with ring oilers from oil cellars and, once the pump is in operation, it requires no attention except to drain off the refuse oil and refill the cellars every week or ten days.

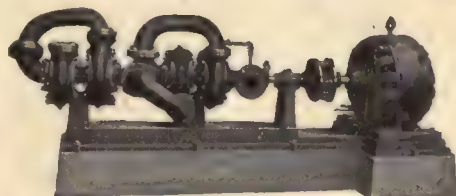
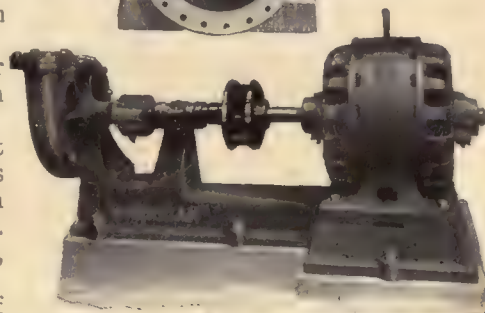
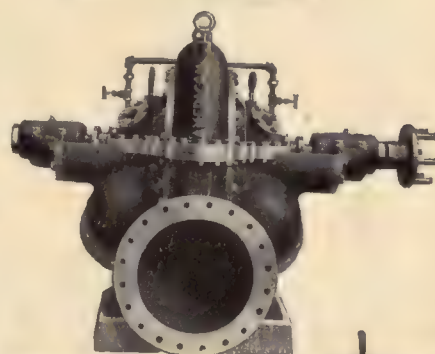
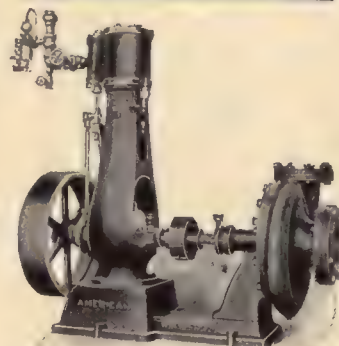
"American" Centrifugals are made in both horizontal and vertical types, in any size, in any number of stages and equipped with any power.

Before you buy pumping machinery for irrigation write for: "Cost of Irrigation." Catalogue No. 104 for the asking.

The American Well Works

General Office and Works:
Aurora, Ill., U. S. A.

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Myers Power Pumps

Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

PATENTED
APRIL 30TH, 1901,
No. 673,282.
JULY 13TH, 1909,
No. 928,234.
AUGUST 10TH, 1909,
No. 930,405.
AUGUST 10TH, 1909,
No. 930,981.

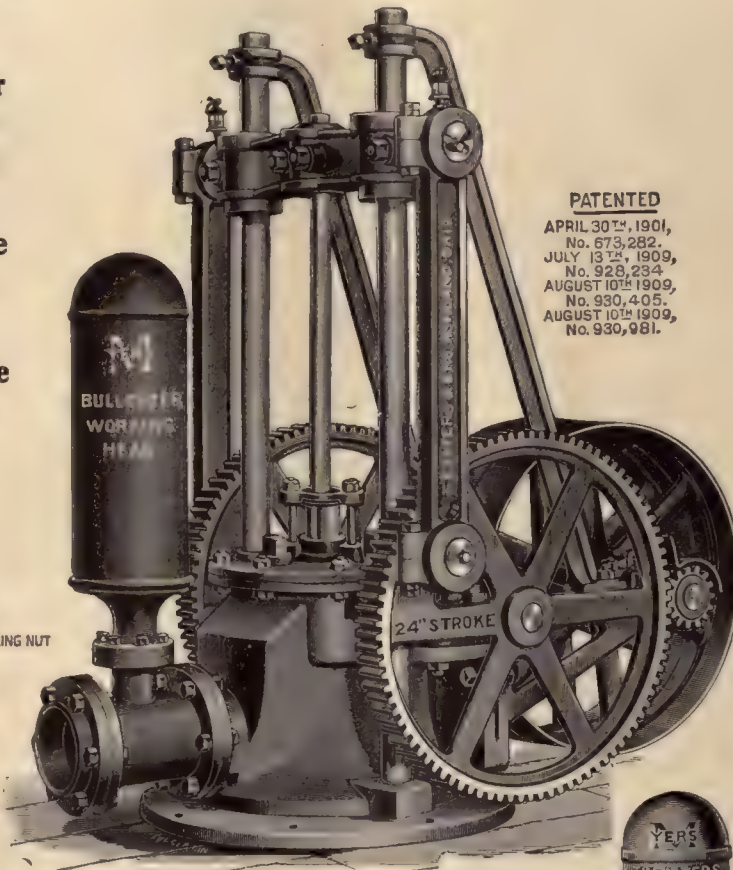
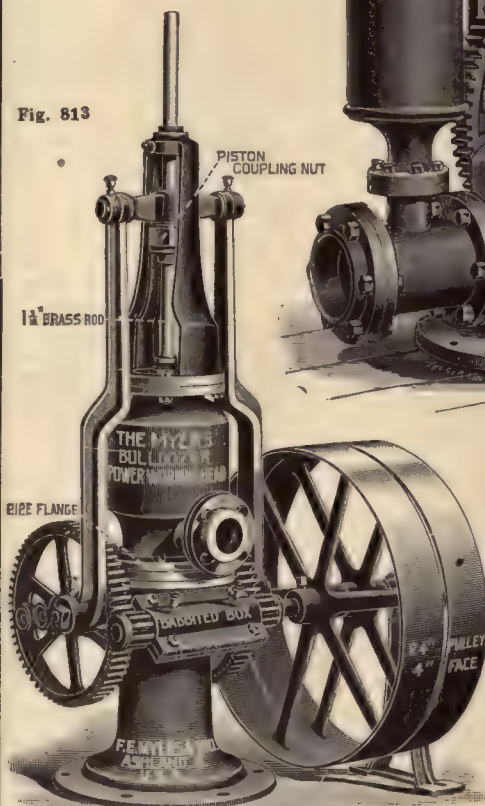


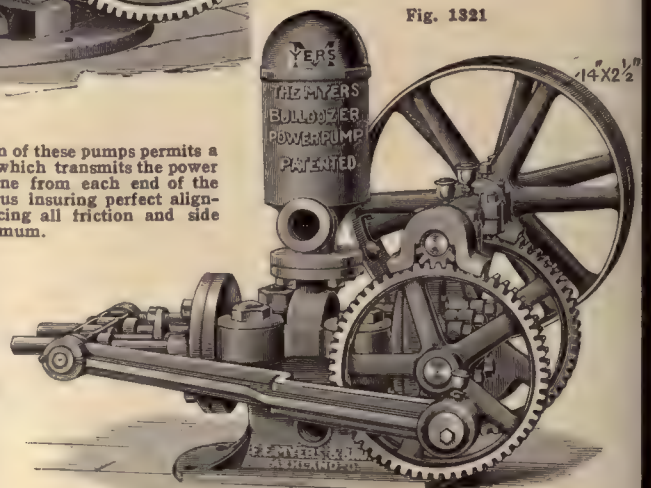
Fig. 813



The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

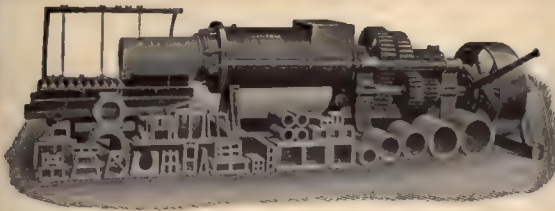
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Catalogue
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Fig. 1321

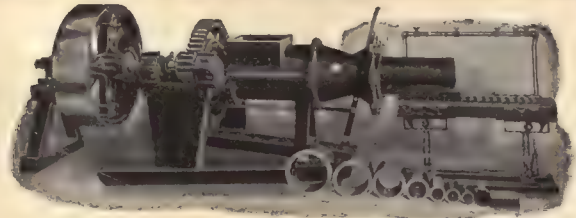


F. E. MYERS & BRO., ASHLAND, OHIO
ASHLAND PUMP AND HAY TOOL WORKS

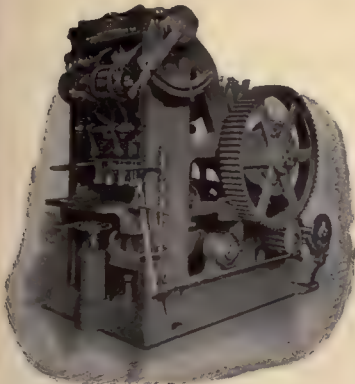
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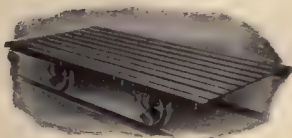
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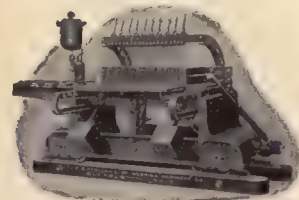
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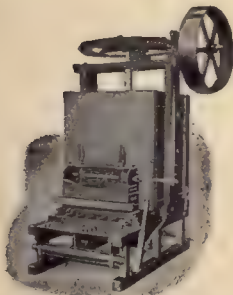
"BUILT RIGHT—
RUN RIGHT"

We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

The American Clay
Mch. Co...Bucyrus, Ohio



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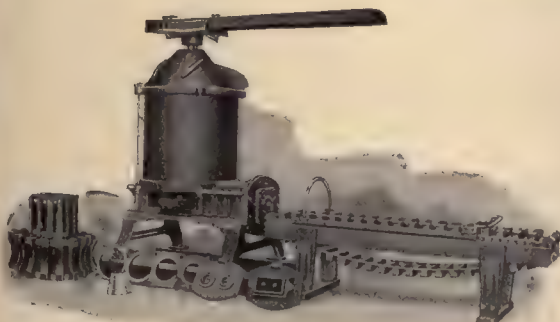
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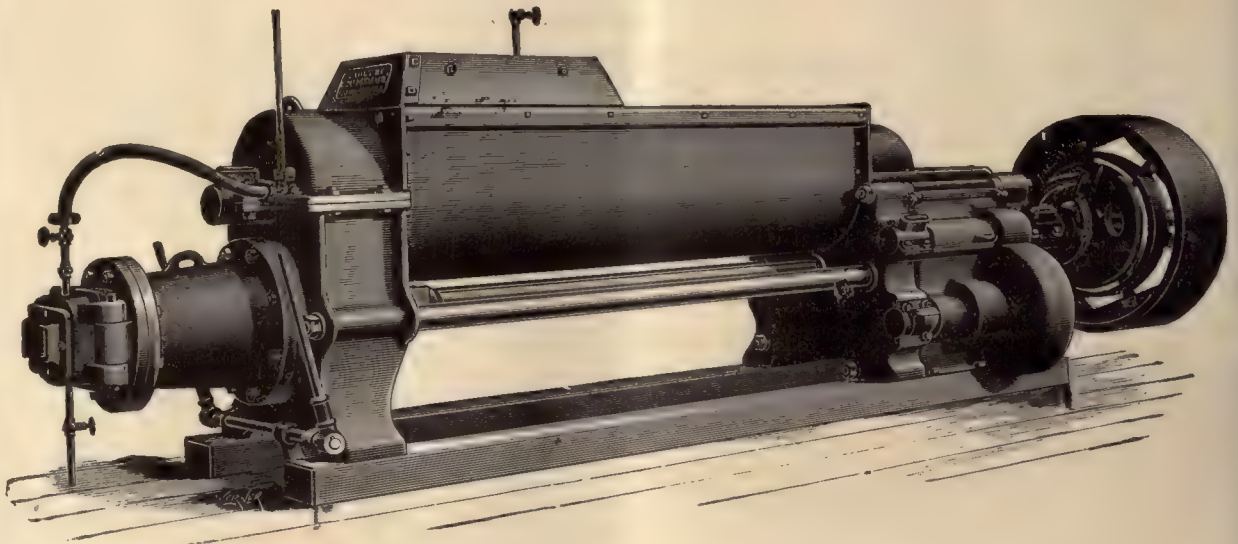


Horse Power Plunger Machine



Products of our Auger Machines

UNION MACHINES WITH PUG MILLS COMBINED



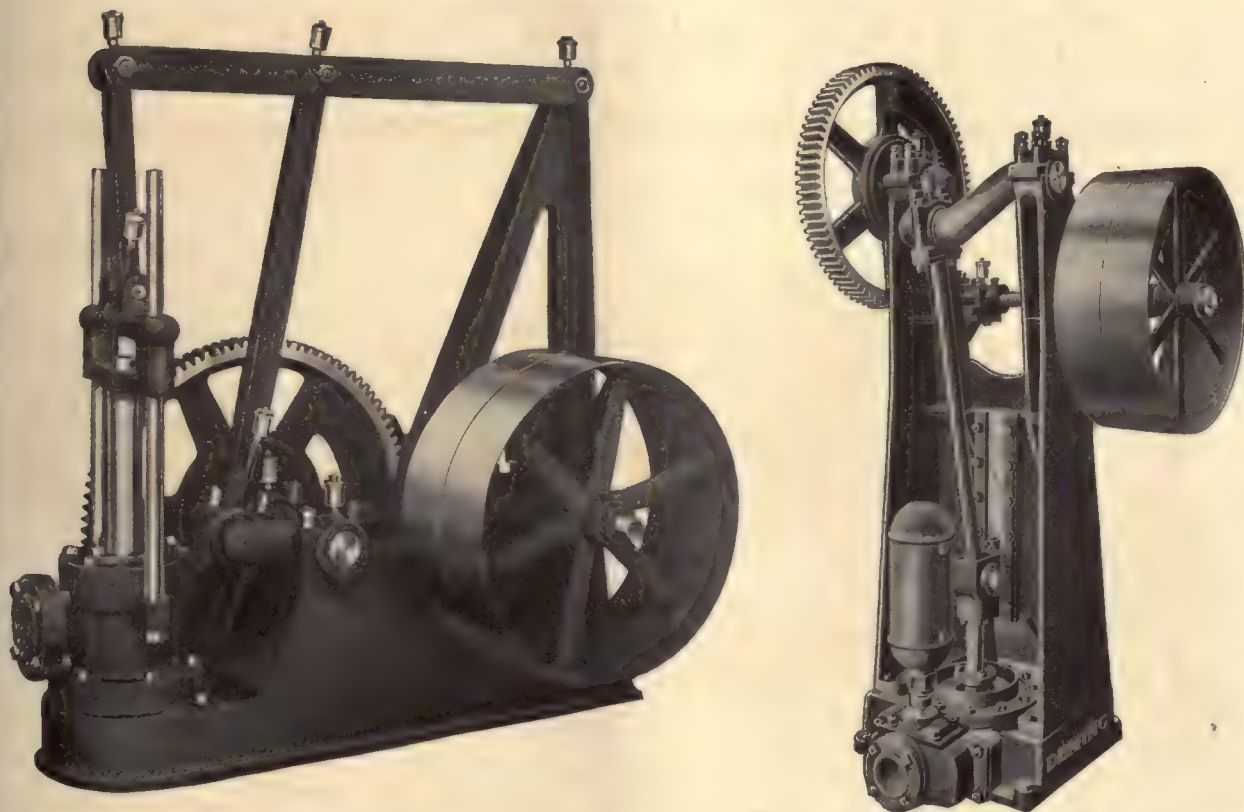
FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
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If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

Deep Well Working Heads



These Working Heads Can be Operated by Electric Motor, Gas or Gasoline Engine, Steam Engine or Belt Driven—the Motors and Engines being Direct Connected if Desired.

The chief advantage to the possessor of a Deming Deep Well Working Head is in the immense saving of power money in direct proportion to the great depths from which the water can be pumped.

Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

THE DEMING COMPANY, SALEM, OHIO

HAND AND POWER PUMPS FOR ALL USES

Including Spray Pumps, Nozzles and Accessories

HENION AND HUBBELL, Chicago, Ill., General Western Agents

Other Agencies in All Principal Cities



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"The Safe Road"

Traverses a Wonderful Country

**With Limitless Opportunities for
Homeseekers, Farmers, Business men
and Professional Men.**

**Growing Towns and Cities. Large
sections of country are being brought
under irrigation, furnishing Land and
Homes for thousands.**

Come out and look it over.

Low Homeseekers' Fares

FIRST AND THIRD TUESDAY OF EACH MONTH DURING 1910

Liberal Stopover and Side Trip Arrangements Allowed

Via

Union Pacific

"The Safe Road"

To Points in

**Nebraska, Kansas, Colorado, Wyoming, Utah, Idaho, Oregon
and Washington—Electric Block Signals**

DINING CAR MEALS AND SERVICE "BEST IN THE WORLD"

**For information relative to rates, routes, etc., call on or address
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THE IRRIGATION AGE

VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO 9

CHICAGO, JULY, 1910

The Eighteenth National Irrigation Congress
Pueblo, Colorado, Sept. 26th to 30th, 1910

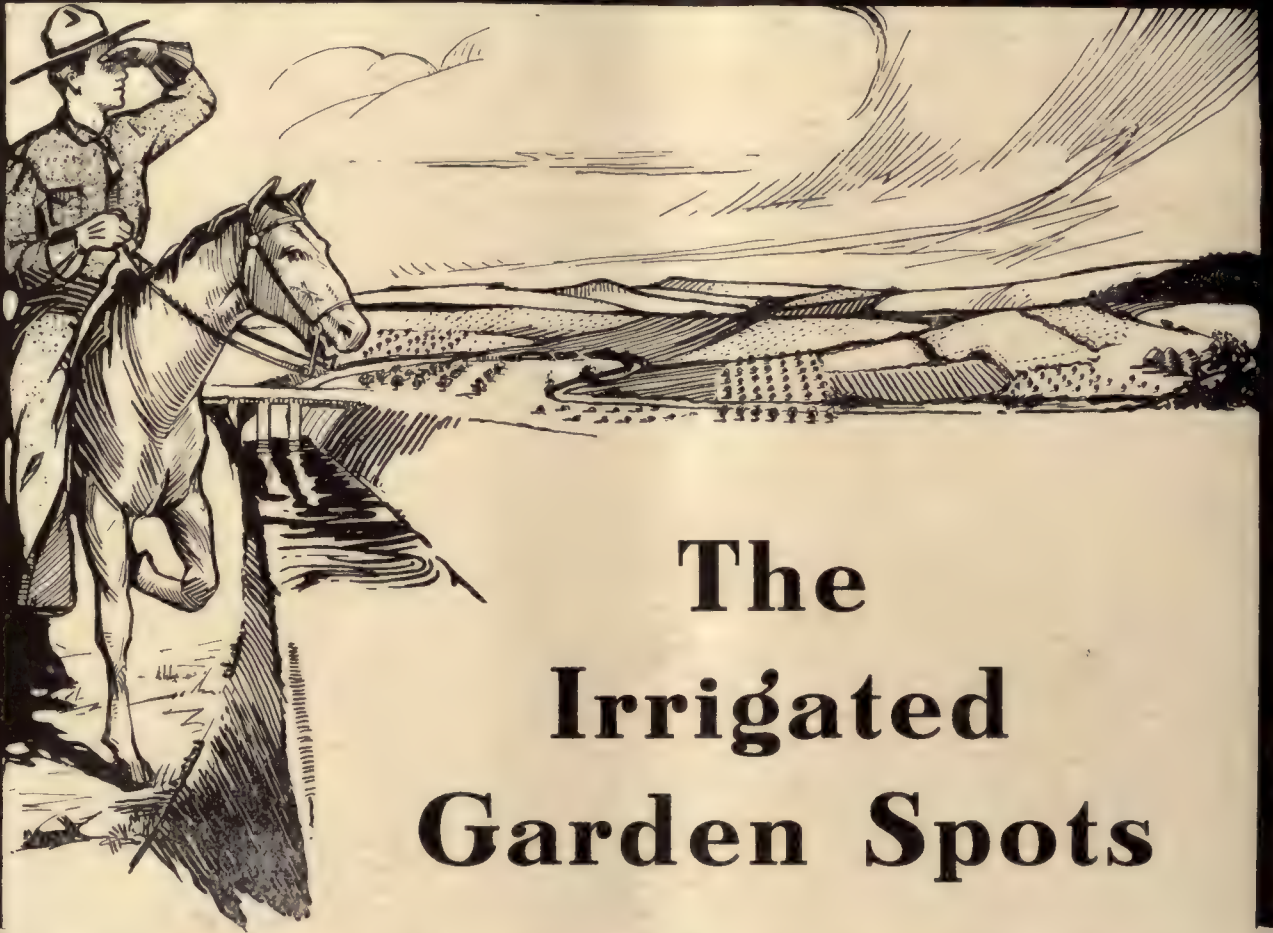


THE IRRIGATION AGE COMPANY, Publishers



CHICAGO, ILLINOIS





The Irrigated Garden Spots

of the Northwest, along the Northern Pacific Railway, not only make ideal homes, but embrace land that is productive to an astonishing degree.

The Northern Pacific extends into or through Minnesota, Wisconsin, North Dakota, Montana, Idaho, Washington, Oregon. New, rich territory being opened up by extensions now building. The homeseeker's chance.

The small, irrigated farm is most easily worked—the tiller of the soil is sure of his crops. His land needs only the water to make it produce bountifully—and the water is there at his command. He farms scientifically, economically and with no waste of effort.

The irrigated lands in Montana, Idaho, Washington and Oregon are cheap when you figure their productive capacity. Farm units under U. S. Government irrigation projects may be secured on easy terms and deferred payments.

The climate in the Northwest is a great inducement. People are constantly buying land there. Don't delay too long. Write tonight for

information about the section that interests you and about the home-getting opportunities along

The Scenic Highway Through the Land of Fortune

Northern Pacific Railway

L. J. Bricker, General Immigration Agent, 220 Broadway, St. Paul, Minn.

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THE IRRIGATION AGE

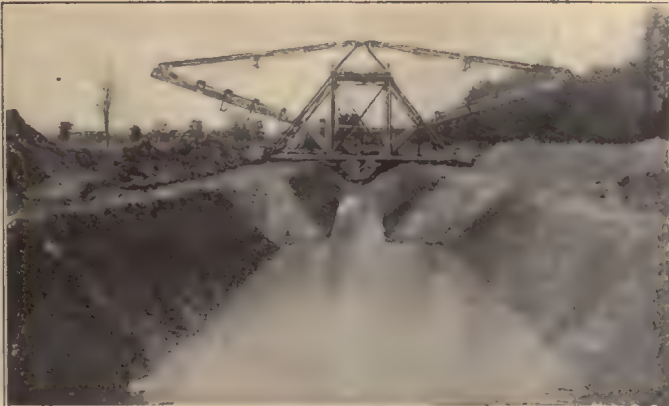
VOL. XXV

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NO 9

CHICAGO, JULY 1910

THE TWO SIZES OF DITCH



Ditch Being Dug with Sloping Banks—An Austin Drainage Excavator Ditch.

shown in the accompanying view were dug by the machine illustrated. This machine can dig any other sizes between the two shown, with any slope of bank desired. It can dig a U-section as well as a trapezoidal section. All that is necessary to accomplish these changes is to alter the guide frame (templet) which carries the self-cleaning excavating buckets.

This

AUSTIN DRAINAGE EXCAVATOR

ditch looks like a ditch, doesn't it? It looks like a ditch that will stand, too. It will stand—the sides are sloped, the spoil banks are away from the edges, the cut is made cleanly without disturbing the ground outside the section. This is the only way to make a permanent ditch.

OUR FULL LINE COMPRISES

The Austin Levee Builder
The Austin Side Hill Ditcher
The Austin Tile Ditcher

The Austin Highway Ditcher
The Austin Drainage Excavator
The Austin Orange Peel Ditcher

The Austin Drag Line Excavator
The Austin Rolling Platform Traction
The Austin Stump Puller and Grubber

We Sell Outright or Lease.

Send for Catalogue "S"

F. C. AUSTIN DRAINAGE EXCAVATOR CO.

Railway Exchange
CHICAGO, ILLINOIS

N. B.—AGENTS WANTED IN UNOCCUPIED TERRITORY

Morris Machine Works Baldwinsville, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

New York Office
39-41 Cortlandt Street
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Agents
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IRRIGATION SCENE IN CALIFORNIA

AMES DEEP WELL PUMP

Driven by a Gasoline Engine

Pump 150 feet long. Capacity 450 gallons per minute



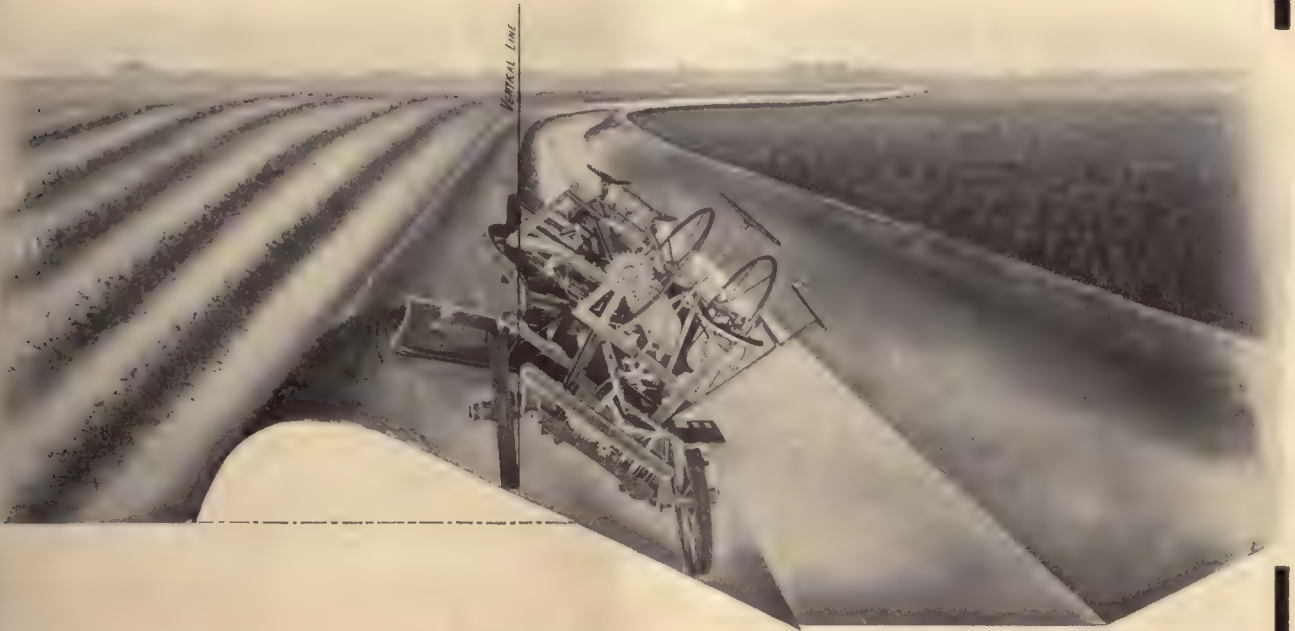
We manufacture Double Acting Deep Well Pumps that pump a continuous stream from well and deliver it either at the surface or through long pipe lines *against high heads above the surface* at one lift. Write

A. T. Ames Manufacturing Co.

NILES, CALIFORNIA, *for Catalogue.*

THE RECLAMATION DITCHER

For Cutting Irrigation and Drainage
Ditches at the Least Cost



U. S. RECLAMATION DITCHER

This type of machine is different from all other ditching machinery, in that it plows the dirt out of the ditch with a continuous sweeping motion, whereas all other machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The cost therefore, per cubic yard, of excavating with the U. S. Reclamation Ditcher is necessarily much less than with any other tools or appliances.

The Reclamation Ditcher is adapted to cutting ditches as deep as three feet below the original surface and as wide as ten feet at the bottom and with sides sloped as steep as 2 to 1.

It has adjustable oblique wheels which perform the same function as the oblique wheels of a sulky plow. They are simply rolling landsides which counteract the side pressure of the earth on the mold and also make it possible for the machine to be operated on the sloping side of the ditch as shown in the cut.

It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

The difference in cost of cutting ditches with the Reclamation Ditcher and any other form of machinery is sufficient to pay for the machine very quickly. We absolutely guarantee this and will prove it to you by a demonstration of the machine on your own work before you accept it.

Write for descriptive folder which gives diagrams of ditches and cost estimates.

J. D. ADAMS & CO., Indianapolis, Indiana

"Your Money Back" Protects You

THE cheap little car, fresh from the factory, looks spick and span, and seems to promise its buyer a great quantity of enjoyment, but—When that buyer gets his *next* car, he *does* not get one of those cheap little cars.

Why?

Not because he likes to spend more money.

But because he wants to *save* money.

• • •

Think that over.

It means something.

• • •

If a new car costs \$1500, and one year's repairs cost \$500, the price of that car is really \$2000.

If this \$2000 car is in the repair shop, getting fixed up, three days a month, its owner is losing one-tenth of its service, or \$200.

This car, therefore, stands its owner \$2200 the first year, although it cost only \$1500 to begin with.

• • •

And in using this cheap little car its owner never knows when something is going to break and leave him stranded miles from home.

Being a cheap car, it can't climb hills like a good car, it lacks the speed of a good car, it hasn't the size, style and beauty of a good car, and wherever the owner goes with it, it advertises him as a *cheap* buyer.

That's why no man ever buys one of these cheap little cars a *second* time.

• • •

If a car isn't worth buying a second time, it *isn't worth buying at first*.

And the buyer who recognizes that fact before he buys any car at all, saves himself much expense, much disappointment, and much annoyance.

• • •

If you are planning to buy a motor car, read every word of this advertisement.

• • •

We have made motor cars continuously since 1896. Mr. Winton made and sold the first gasoline car produced in America. He has made and sold more first-class cars than any other single manufacturer. And we have on our books the names of men who have bought as many as six or eight of our cars. One buyer, Mr. L. R. Speare, president of the American Automobile Association, has owned and used 16 different cars of our manufacture.

It is because Winton cars are right in the first place—right in material, workmanship, power, style, beauty and cost—that once a man buys a Winton he will never be satisfied with any other make.

• • •

One reason why this is true is that the Winton car stands up under hard use with a smaller repair expense than any other car on the market.

Sworn testimony of 20 Winton owners (we send you their names and addresses upon application) show that 20 Winton cars traveled 184,190 miles on \$142.43 repair expense.

That distance is more than seven times the distance around the earth at the equator.

And each car's average repair expense for 1000 miles was 77 cents.

That's a world's record that touches the pocket book of every automobile owner.

Compare that record with the expenses of the owners of other cars—right in your own neighborhood.

• • •

This wonderfully low expense record of Winton cars shows that they are right in the first place—right in material, workmanship, power, quality, performance, right in everything that makes an automobile worth while.

• • •

And because they are right in the first place, Winton cars stand up longer than any other car on the market.

There are any number of Winton cars made as far back as 1901 still doing daily service in this country.

No other maker has a record to compare with the Winton record.

• • •

And because Winton cars stand up indefinitely, and run at lower expense than other cars, it follows that a Winton car is always a good purchase, no matter how old it may be.

For the quality is in the car itself, and it stays there.

If the quality isn't in the car in the first place, you can't put it in.

And that's why the buyer of a cheap little car never buys one of the same make a second time.

Because it depreciates so quickly that what little merit it originally possessed is soon gone, and the car is worthless.

• • •

We realize that there are many buyers who hesitate to put into their first car as much money as we get for our 1910 model—\$3000.

But we want the trade of these buyers just the same, because we know that once they become acquainted with Winton merit they will be the best salesmen for Winton cars we could get.

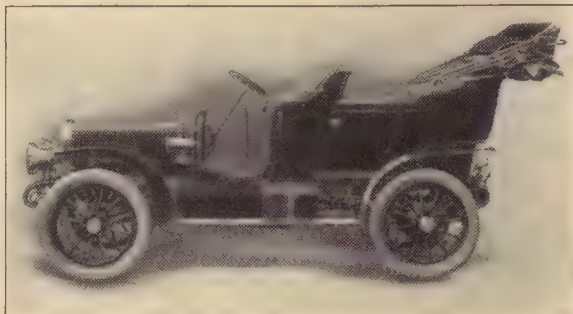
So we have devised a plan where the man who doesn't want to spend \$3000 can still get a Winton car, and be in the class of high-grade buyers and satisfied owners.

• • •

This is the plan.

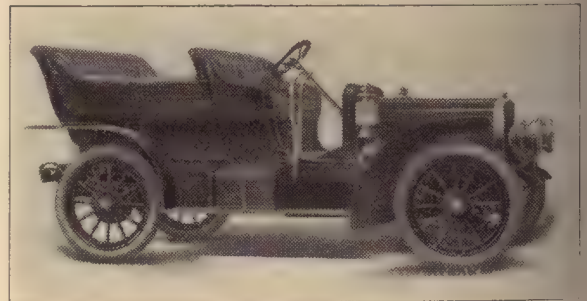
Some of our buyers want a new car every year—in order to have the very latest style of body, the latest thing in fancy trimmings, and the like.

These buyers turn over their used cars in part payment for new cars.



WINTON MODEL K.

Four-cylinder, 30 H. P. motor. $4\frac{3}{4}$ -inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Three brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4-inch tires. Wheel base 102 inches. Gasoline tank, 15 gallons. Five-passenger body. Original price, \$2500. Bargain price, \$600 to \$800.



WINTON TYPE X-I-V.

Four-cylinder, 30 H. P. motor. $4\frac{3}{4}$ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Semi-floating-type rear axle. Forged-steel front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on ball bearings. 34x4-inch tires. Wheel base 104 inches. Gasoline tank, 22 gallons. Five-passenger body. Original price, \$2500. Bargain price, \$700 to \$950.

From Mistake in Buying a Motor Car.

In the past it has been our custom to sell these used cars to city buyers "just as they stand."

But we have changed our policy—in order to get your trade.

...

We take these cars into our factory, replace worn parts, tune up the car to top-notch running condition, revarnish the body (sometimes giving it an entirely new coat of paint), and offer this car to you at exactly what it costs us.

This policy puts you in possession of a high-grade car at an exceptionally low price and makes you an enthusiastic advertiser of Winton cars.

...

And remember this: If you ever buy a Winton car from the Winton Motor Carriage Company, and it is not exactly as represented, we give you your money back without bickering or delay.

YOUR MONEY BACK is something no other automobile maker offers. We make the proposition because we know we have the best cars that skill and experience and facilities can produce.

...

Look over the bargains offered on this page. Pick out one that looks best to you, and write us about it.

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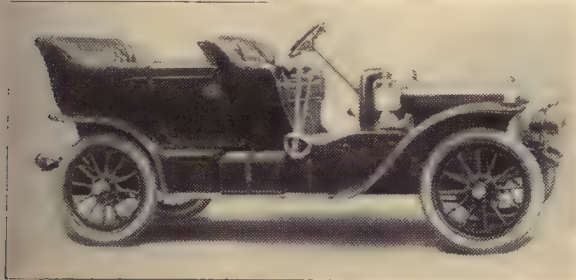
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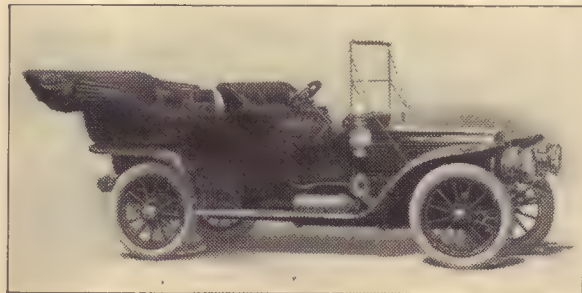
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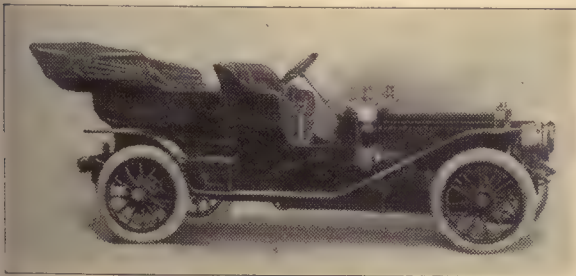
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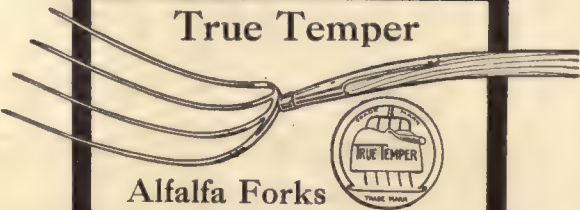
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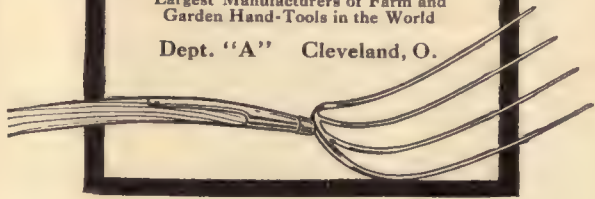
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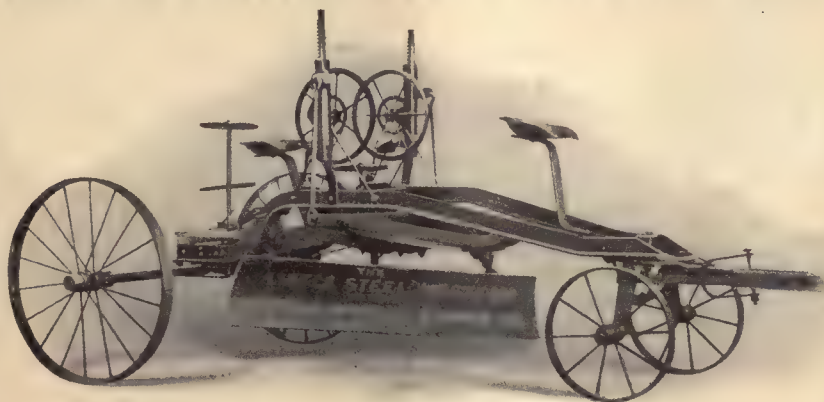
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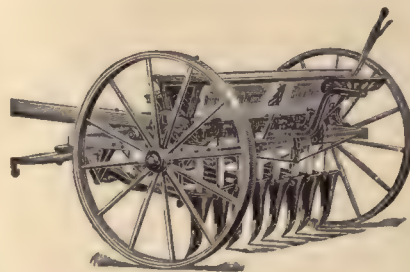
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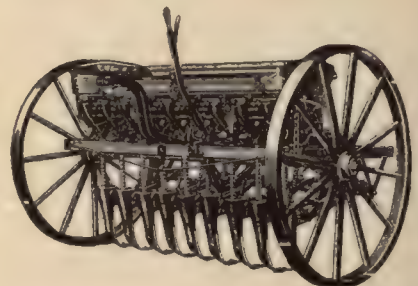
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THE IRRIGATION AGE

VOL. XXV

CHICAGO, JULY, 1910.

No. 9

THE IRRIGATION AGE

With which is Merged

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THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Delay in Securing Articles

We regret to announce that the articles which are being prepared for us by Dr. R. C. Brophy of Chicago, will not be ready for our July number. Dr. Brophy had contemplated putting in the greater part of the summer in the lower Rio Grande Valley, but sickness at his home in Illinois necessitated his return. He informs us that he will have something prepared for our August number which will, no doubt, prove of much interest to our readers.

Eighteenth National Irrigation Congress.

In this, our principal issue in connection with the National Irrigation Congress, we are presenting a great deal of extremely interesting matter which has been prepared for us by local Coloradans and those connected with the Congress. It is predicted that this will be the greatest Congress ever held, and from present indications there is no reason to doubt the truth of the statements made by the people of Pueblo, to that effect. The citizens of Pueblo have performed marvelous feats in the way of raising funds to carry on the Congress, as well as along publicity lines.

Fountain Valley Colorado Project.

On another page in this issue will be found an illustrated article describing the famous Fountain Valley and lands under the system known as the Fountain Valley Land & Irrigation Company's project. The IRRIGATION AGE ranch is located on this tract, and a number of good photographs were recently secured by the editor while spending a few days there, which are shown in connection with the article.

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Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 25 years old and is the pioneer publication of its class in the world.

This project is notable for its splendid growth and the fine results which have been obtained by settlers. Some difficulty was encountered last year through wash-outs from storms, but that has all been overcome by the establishment of permanent flumes, and it is safe to say that the Fountain Valley, through the instrumentality of Mr. Wm. Johnston, president of the Fountain Valley Land & Irrigation Company, will make rapid strides from now on.

Director Newell Favors Canada.

It is entirely unfair to assume that Director Newell of the Reclamation Service is to be beheaded solely because of his connection with the band of official malcontents who have, in every way possible, tried to thwart the acts of the Department of the Interior in reclamation matters.

Mr. Newell's many acts of insubordination and incompetency are alone quite sufficient to make his retirement necessary, but the IRRIGATION AGE calls attention to one single act of his which in itself condemns him as unfit for the position he holds, and, in fact, proclaims him not a friend but an actual enemy of American irrigation enterprises.

Obtaining a leave of absence from his official post, he visited Canada and presumably, for good pay, wrote a report upon a private irrigation enterprise in that country, in which he not only extols its advantages, but compares them to the great disadvantage of similar projects in the United States.

To quote his own words, "It is a revelation of the enterprise and energy of our Canadian neighbors who have established an irrigation system infinitely in advance of

anything in the United States, and comparing the selling price and terms upon which irrigated lands are sold, with the regulations and charges encountered under the Reclamation Service Act of the United States, one must admit that the Canadians hold out inducements that we cannot hope to duplicate."

These statements coming from Mr. Newell in his official capacity, was intended to induce American farmers to abandon their intention of buying irrigated lands in "The States" and to leave the United States with their families and their money to settle on the irrigated lands of Canada.

It is stated that this document, under Director Newell's official name and title, has been sent to hundreds of thousands of farmers throughout the middle west and its influence in setting the tide of immigration away from our own country is not easily estimated.

IRRIGATION AGE has always heretofore given Mr. Newell credit for an honesty of purpose, while criticising his methods, yet we confess to a feeling of something greater than surprise in this exhibition of mercenary disloyalty to the interest of the people he pretends to represent.

A Bit of History About the Ames Monument.

All of those who have gone across the Continent over the Union Pacific Railway during the past years have no doubt had their attention called to the famous Ames monument on Sherman Hill, Wyoming. This monument was at one time close to the railway and was easily seen by all passengers. When, however, it became necessary to move the line of railway to secure better grades the monument was left so far behind that it is now only discernible from passing trains at one point and then only for a moment.

There is a little history connected with this monument which is not generally known. At the time it was erected the railroad company evidently overlooked the fact that it had been constructed on vacant public lands. In September, 1885, Wm. L. Murphy of Laramie, who was aware of this fact, filed on the 40-acre tract of land upon which the monument had been erected. He subsequently advised the railroad people that it would be pleasing to him to have the monument removed from his land, and they became suddenly very much alive to the situation.

An agent was sent to Laramie to secure his title or a relinquishment thereof. The agent, so it was currently reported, was instructed to spend \$10,000, if necessary, to secure title. He offered Murphy in trade for his 40-acre tract, two town lots in the Union Pacific's original holdings in Laramie. Murphy evidently misunderstood the value of the lots, or blundered some way in the settlement and thereby lost what might have proved a snug sum for his declining years.

It was, however, a serious mistake for Murphy to locate a desert filing on the land. While it certainly was desert, there was no actual means of securing water for irrigation, as the eminence upon which the monument is located is higher than all the surrounding country. Had he located the land with any kind of land script instead of making a desert filing, his position would have been greatly strengthened. It is possible that his knowledge of the situation prompted him to accept the offer of the Laramie lots, yet the fact remains that he could have gotten from the railway company's agent \$10,000 had he been keen at a bargain.

It is safe to say that there will never again be a ques-

tion of title to the land upon which the Ames monument is erected. There is enough stone in the monument to erect an immense castle, and it is a pity that so remarkable a landmark has been left, through turning the course of the railway, so far away that overland passengers may not secure a good view of it.

Is Carey Act Administration Fair to Westerners?

The IRRIGATION AGE has published the Carey Act Law in former numbers because it is desired that all interested in irrigation matters should be acquainted with its provisions. We trust that this national statute has been read. It is simple in its terms and it seems to be a wise piece of legislation. We believe that it is and we feel that Congress intended that it should be simple in administration. It was not difficult, ten years ago, to conform with the requirements of the law. Today every branch of the Interior Department that has been able to break into this particular administrative work seeks to have its views heeded.

The Carey Act law plainly places the responsibility for the design of irrigation works, the adequacy of the water supply and the reclamation of the lands on the States. The States have engineers who understand all of these matters. The States have more complete records of the discharge of streams than has the Interior Department. The States are to be injured or benefitted by the development that is promised under every Carey Act project yet the various bureaus of the Interior Department attempt to give the Secretary of the Interior advice when he should accept the statements of State officers and make the States responsible for success or failure.

The bureaus obtain their information from special agents and employes who are not familiar with irrigation matters. There is not a single man that we know of who is relied upon by these bureaus to report on irrigation projects that has ever had experience such as would render him capable of making a report that would be accepted anywhere except by the government.

No private interests would employ such men to furnish them with reports which would guide them in making investments. No western State would employ such men to assist in the State administration of the Carey Act. Regardless of this, the information upon which the Secretary of the Interior is presumed to act, must come from such a source, when the law plainly places the responsibility upon the States alone. The tendency of the national government to regard the States as incompetent and their officers as dishonest, must sooner or later result in a contest which will bring about an interpretation of national statutes which will place the States on the footing that Congress intended that they should have.

The investor in Carey Act enterprises knows well the difficulties that are now presented. He must deal with several sub-departments of the Interior Department. He must lobby with clerks and cheap department attorneys. He must follow up the application for segregation and get the assistance of his delegation in Congress. He must resort to every method known to the politician, the society leader and the marshal of troops to secure what the law intended he should have when he has satisfied the State that his project is properly planned and that the water supply is adequate.

The irrigation engineers of the West are the most capable men that the world knows today. They are honest in their reports and understand fully what is necessary

for the success of any project. It is unnecessary and unjust to have their work reviewed and progress suspended by men who are not experienced and whose only strength lies in their ability to report to those who have power under the law to retard development.

It should be the policy of the national government to encourage the development of capable and honest State administration. The government should accept State reports as final and conclusive. It should hold the States responsible throughout and if failure occurs the State administration should be held accountable. The national government can never have an intimate knowledge of local conditions. It can never do justice to the West when decisions must be based on the reports of special agents. The result of such a practice is delay and business stagnation.

**President
Taft's
Great
Work.**

No president in recent years was ever so beset by opposition to his administration as that which President Taft has encountered during the session of recent Congress. At the very beginning the conservative element in both House and Senate were secretly determined that his progressive policies should not be carried out, and it was a matter of open knowledge that his tariff policies, although frequently pledged to the country, were to be opposed by the dominating powers.

For a time the President's real friends, both in Congress and out, felt some alarm lest his administration would result in nothing of importance to the country or credit to himself.

He was called weak, vacillating, and without influence, by the majority of the Republican press of the country, and by many influential men who declared he failed to keep his party pledges made in platform and on the stump.

As time went on, however, President Taft developed a tenacity of purpose and skill of political management and an influence upon all elements in Congress which not only surprised his friends but disconcerted his enemies. Not until thirty days before Congress adjourned did it appear as though any of his important measures would be passed; but in the last strenuous days of that eventful session President Taft accomplished more big things for the permanent benefit of the country in the way of wise legislation, than any other President who has preceded him since Lincoln.

The most important, following the passage of the Tariff Bill earlier in the session, is the Railroad Bill, greatly strengthening the powers of the Inter-State Commerce Commission, and placing telegraph, telephone and sleeping car companies under its control; the Postal Savings Bank Bill, a measure which was bitterly fought for many months previous to the assembling of Congress and all through the session, and in fact, every important measure advocated by the President in his inaugural message was put through Congress without being twisted out of its original shape by the various interests who vigorously opposed them all in the beginning.

To irrigation interests and to all land interests in the west the Mondell bill, appropriating \$20,000,000 for the completion of irrigation works now under way, and the inauguration and development of new enterprises, is of the greatest importance. This bill gives the President

specific authority to make temporary withdrawals from entry of public lands, a power which has heretofore been exercised without authority. It is a noteworthy fact that both of these measures were vigorously opposed by the adherents of Pinchot and Ex-secretary Garfield, who claimed that they implied a reflection upon the course of the Roosevelt administration. In a measure, this is true, but the withdrawal measure simply means that President Taft will now have the power to do exactly the things that heretofore have been done without authority of law. He will have the power to withdraw lands temporarily, but Congress must, in the end, hereafter determine the interests of the people. It has the power to set aside the President's acts if they do not meet with the approval of the people.

The west, therefore, will not lose anything by these conservation laws, but on the contrary, they will be greatly benefited and their interests will be more carefully safeguarded than ever before, and particularly under the reckless, and unlawful methods used by the Garfield and Pinchot administrations.

This bill will open up millions of acres of new lands, as it authorizes agricultural entries on coal lands and will also open many million acres now included in coal withdrawals and classifications.

President Taft has shown a wise understanding of the needs of the people in every measure he has introduced, and in every policy he has advocated, and it is not too much to say that no administration in recent years ever stood higher or held a warmer place in the hearts of the people.

**Problems
Confronted
By the
President.**

No person, not acquainted with conditions in Washington a year ago, has any appreciation of the problems that confronted President Taft. For years political bureaux have been permitted to run riot, to overturn acts of Congress and to spend public money for personal publicity purposes. President Taft evidently saw what was ahead of him. He well understood how much deception had been created and he doubtless knew that he would be an object of criticism as soon as he sought to curb the publicity practices that had secured such a hold in three or four of the departments.

All honor to him for the stand he has taken and for the fight he has made. He is not understood even today, as he will be within the next year. It was known that when Mr. Ballinger was Commissioner of the General Land Office that he was unpopular among the politicians of several of the departments. Mr. Pinchot could not work Mr. Ballinger. Neither could Mr. Newell. Neither could Mr. Smith, the Director of the Geological Survey. Even Mr. Garfield could get nothing through the General Land Office that the law did not permit and recognize. To keep peace in the family and at the request of the heads of several of the most notorious bureaux, Mr. Ballinger was asked to retire.

When President Taft appointed him as Secretary of the Interior it was recognized that a new era had begun. The politics and personal campaign methods which the bureaux had so successfully inaugurated had to come to an end or there would be some vacancies in office. Mr. Pinchot could not stand this. He was compelled to do business through the head of the Agricultural Department.

This was annoying. He had hitherto gone direct to Congress or to the President and the Secretary of Agriculture had been ignored.

He chafed under the new order of things and finally placed himself in such position before the President that either he had to give up his office or the President had to retire. Since Mr. Taft was elected by a very good majority of the voters of the country and had some responsibilities resting upon him, he did not deem it wise to give up his important office, even to save Mr. Pinchot. Mr. Pinchot therefore detached himself from public service.

Mr. Newell was requested by the Secretary of the Interior to work under his department. The law under which Mr. Newell is supposed to operate requires this. The provisions of law never appealed with any great force to Mr. Newell, however. In this instance he seemed to think that Mr. Ballinger was in earnest and Mr. Newell has been very mild and obedient. For the first time in ten years he has not spent his winter in the lobby of the capitol building. For the first time in that period he did not marshall his engineers from the west and parade them up and down Pennsylvania avenue. It was an unusual season in Washington.

Mr. George Otis Smith of the U. S. Geological Survey was wiser. He is at the head of the oldest political department and one of the most effective and persistent of advertisers. It is from Mr. Smith that the reform element get statistics to show the public that the coal supply is about exhausted. Through Mr. Smith's activity also the undeveloped coal regions of the West are reserved and preserved for posterity. This gives him something to do, and at the same time it is a great benefit to those already in the coal business. It means that no competition can spring up.

Mr. Smith does many other things for posterity. We have no knowledge as to whether he has better reasons for being interested in posterity than has Mr. Pinchot. Mr. Smith evidently saw the handwriting on the wall. He has been very diplomatic. He has hovered about the office of the Secretary like a turkey buzzard, watching for an opportunity to show the Secretary that he is a good boy and at the same time ready to land on any person who has the temerity to ask the department for permission to make use of some of the public natural resources.

Mr. Smith has dealt cards with both hands. He is well fitted for the position he holds, and because of his apparent success to date he reflects credit on a department that was created and conducted by and for politicians.

Mr. Taft has done much. Those who know what the inside of the bureau machinery is like, feel that he has worked a miracle. He has much to do before the reading public recovers from the effects of the insane advertising that has been indulged in for the past ten years. This is up to the public rather than a duty that confronts him.

We know what the result is to be. We know what the truth is regarding the work of the Forest Service, the Reclamation Service and the Geological Survey. We know that truth must, sooner or later, come to the surface. Mr. Taft is not a spectacular actor. He does not play to the galleries. The sensational does not affect him or blind his judgment. He is the man for the time and for the place.

May he live long and prosper. May he continue to disappoint both extremes and proceed to carry out his policies that are sound and safe. He is to get the sincere support of the great majority of thinking men. This is all that the best and wisest of rulers can well anticipate.

Thoughts Along Conservation Lines.

We prophesy that the "conservation" campaign will be brief. Those who have followed Mr. Pinchot's career know that he has become notorious by advertising and not because of good works. "Conservation" is the most recent name for his policies when grouped together. No person who understands the work that Mr. Pinchot has been doing in the west has any use for his theories which when carried into practice can only result in business stagnation. The only good that could possibly come from following his policies would revert to the bureaus which have so adroitly striven for power during the past ten years. We do not wish to enter into a detailed argument as to the facts. We ask those who doubt our position to make a brief investigation on the ground. Then if they have any questions that they wish to present we shall be glad to enter into such details as may be necessary in each case.

The greatest fault of the bureaus during the past ten years lies in their disregard for acts of Congress. Rules and regulations made by the departments are superior to laws in the minds of several bureau chiefs. Mr. Taft found a condition confronting him that required prompt and decisive action. A little coterie of men, consisting of Mr. Gifford Pinchot, Mr. James R. Garfield, Mr. F. H. Newell and a few minor lights had set themselves up as judges and interpreters of law and as despotic leaders in economic and political questions.

Mr. Taft has done wonders in the past year. He discovered the root of the trouble without much effort. He found that the bureaus were conducting press agencies with government funds and that a large part of the reading public had already been deceived as to the merits of the pet policies of government employees, who are presumed to be hired under acts of congress to perform certain duties as executive officers and not to invade the legislative and judicial branches of government.

Unfortunately the Pinchot-Ballinger investigation did not enter into the press bureau work of these departments. Unfortunately this investigation did not embrace the work of the bureaus as fully as was anticipated. Had the truth been published as to the advertising work of the bureaus, much of the present misunderstandings would have been avoided.

We should like to call attention to one manifest injustice to the West. The Director of the Geological Survey is from Maine. He knows nothing about practical work. He might do in the class room or in an assembly of scientific men. He is dangerous when placed in charge of such work as he is presumed to conduct. As an example, we simply need refer to one instance. The "conservation" movement naturally appealed to the Director. It presents some problems that can be juggled with and offers an opportunity for advertising. He is heart and soul in sympathy with the radical element that would stop the growth of the West to bolster up the bureaus at Washington.

As a matter of policy the Director has played in with Mr. Ballinger with one hand while he has tried to throttle western industries with the other. He has thus maintained himself with the "conservationists" and held his job with the government at the same time. The one thing that appealed with particular force to the Director is the water power phantom. He is at the head of the department that discovers(?) and reports upon all of the coal fields. He is afraid to make an estimate as to the extent of our coal supply because this is so enormous that it does

not look good in an argument that would have to frighten the reading public to be effective.

However, he has indorsed the proposition that the coal supply will give out some time or other. He might go on and say that the sun's heat will gradually be dissipated and that something will have to be "conserved" by us now to keep posterity from freezing to death. He has joined hands with the "conservationists" in the cry that our water power is to be monopolized and that it is liable to be used to its full extent. The problem that the West has to deal with relates to settlement. It is an effort to get lands ready for the newcomer. It is difficult to keep the general government from reserving everything that is necessary for growth and development.

The Director does not know evidently, that the mountain states of the West have unlimited opportunity for water power development. He does not seem to know that the States and not the nation at large has control of the waters of streams. He does not seem to know that these States are better able to protect the public against monopoly than is the general government. He does not seem to know that many of the States have taken precautions which will protect the public. His idea is not to protect the public so much as it is to secure the adoption of some law, rule or regulation which will enable the general government to derive an income by taxing western power development. This means that the local consumer of the power must pay the tax.

Recently our attention was called to an irrigation project in Central Wyoming which has been fostered by the State administration and development so directed that the best kind of irrigation works will be constructed, the lowest rates guaranteed for water rights and arrangements made for the final ownership of the system by the water users. In connection with this project it will be necessary to store a large volume of water. A natural lake was found to be available for this purpose. An application for a right of way to use this lake for storing water for irrigation was properly made. It finally came to the attention of this director of the Geological Survey and he has written the Commissioner of the General Land Office that he would recommend that the application be suspended owing to possible water power values.

Think of this! Fully two thousand families can find homes on the lands to be reclaimed. This means a population of from ten to one hundred thousand people. The country cannot develop until agriculture is made possible. Agriculture is impossible without irrigation and irrigation is impossible without storage. There is no market for power. People must be secured to use power before it pays to install the necessary machinery and transmission lines. Water power can be developed on every stream. Monopoly is impossible and the end will never be reached in water power development. Wyoming is the most progressive State probably in the administration of streams. It is twenty years in advance of the general government. It does not advocate a special tax on those who use water power, but it does stand for public control at all times for the benefit of the public.

Yet in face of these facts the Director of the Geological Survey would kill a great development enterprise and deprive two thousand families of an opportunity to secure homes simply to carry out a new fad that the "conservationists" have preached through their press bureaus. We have simply stated the facts and leave the conclusions to the reader.

THE NATIONAL IRRIGATION EXPOSITION.

Here Will be Shown the Successes of Irrigation, Pumping, Its Accessories, Machinery, Drainage, and Irrigated Products.

THE greatest irrigation exposition ever held in the west will join hands with the Eighteenth National Irrigation Congress in welcoming the world to Pueblo in September.

The dates of the exposition are September 19-October 1.

The exposition will begin simultaneously with the Colorado state fair, the latter lasting one week, or until September 24. At that date, all irrigated products will be transferred to the exposition, theretofore maintained in behalf of pumping, machinery, drainage, irrigation devices, etc., and the merged affair will continue the following week, or during the irrigation congress.

The exposition will be held on three sightly blocks of land just across from the famed Mineral palace, and handy to the congress. Mineral palace is set in beautiful Mineral park, the most attractive spot wherein sessions of the congress have yet been held, and the proximity of the exposition grounds will lend especial interest.

The exposition will consist of all kinds of irrigation devices. There will be reservoirs, open ditches, pumps and sumps, cemented laterals, subirrigation demonstrations, weirs, systems of measurements, etc. There will be large machinery, lecture tents for illustrated addresses, literature tents where communities and companies will tell of their advantages, and last but not least, all kinds of irrigated products.

The director of exhibits, Mr. L. M. Markham, a trained engineer and a born executive, has for some time had his office installed in the Central block, Pueblo, and is receiving orders for space and answering inquiries as to possible exhibits.

The exposition promises to rank close up to the irrigation congress in interest. Manufacturers, engineers, architects, practical irrigationists, and all classes interested, are vying with each other in their earnest endeavor to make the exposition a finished thing, something that will stand out clear and distinct in the minds of the visitors when they shall have departed from Pueblo next fall.

Strongly back of the exposition is not only the Eighteenth National Irrigation Congress itself, the board of control of which gave life to the exposition, but the engineers and technical people. One foremost factor is the Arkansas Valley Society of Arts and Sciences, the engineers' society, as it is commonly called. This association includes all the engineers of Pueblo and southern Colorado, and of the Arkansas valley in Kansas.

As to irrigated products, the fact that 25 Colorado counties are now growing products especially to be exhibited and are making liberal appropriations, insures the success from that standpoint. The far-famed Arkansas valley, the wonderfully productive Western Slope with its magnificent fruit, the northern Colorado district with so much to its credit, will all be there, and adjoining states are desirous of making displays. A system of trophies and prizes, diplomas and medals, has been worked out by the director of exhibits and the very enthusiastic exhibits' committee of the board of control, of which Mr. J. A. Barclay is chairman, and will lend zest and spirit to the displays.

As to trophies, some splendid ones will be offered for competition. Some will be loving cups, others of similar design, all calculated to provoke the greatest rivalry between communities. Among those who are contributing trophies are: William R. Hearst, United States Senator Simon Guggenheim, Governor John F. Shafroth, Irrigation Age, Ranch and Range, sugar companies, and public spirited corporations and citizens.

Many communities and counties are offering cash prizes to their farmers who will grow the best displays of beets, alfalfa, fruit, corn, wheat, vegetables, and other products, under irrigation. In some communities, these prizes in cash and in trophies, for local endeavor, will run as high as \$1,000.

It is clear already that the marked success of the National Irrigation Exposition is assured.

EIGHTEENTH NATIONAL IRRIGATION CONGRESS

TO BE HELD IN PUEBLO, COLORADO, SEPTEMBER 26-30, 1910.—EVERY INDICATION THAT THIS WILL BE THE LARGEST AND MOST SUCCESSFUL EVENT IN THE HISTORY OF THE ORGANIZATION.

By R. H. FAXON

THE Eighteenth National Irrigation Congress came to the State of Colorado and to Pueblo at the exact psychological moment.

The eyes of the country are turned today on the West, and on the Mountain-West, at that.

There is greater interest today in development—in the big work of the West—than there ever has been before.

Pueblo is located in the very heart of the irrigated West, and is the center of an irrigated territory that is surprising in its accomplishments and in the future before it. Pueblo is also the seat of large effort of a successful nature in extending the irrigated area of Colorado.

It is peculiarly significant that the greatest sessions of this foremost development agency of the land should be held, first, in the state having the greatest irrigated area of the states of the West—for Colorado has more than 3½ million acres under water; and, second, in the city, the second in size in Colorado and the third in size and importance in the Mountain-West, that was named for a tribe of Indians that practiced the ancient art of irrigation centuries ago.

Colorado stands foremost among irrigated states. More than a generation ago—indeed, 40 years ago—irrigation was cradled in the famous north Colorado district. Only the endeavors of the Pueblo Indians in the great Southwest and of the Mormons in Utah antedated effort in this state. The finished type of irrigation in the north Colorado district, along the South Platte, is of the highest possible character, and has long achieved the wonder of the country and the accomplishment of complete success.

Pueblo for some years has aspired to the most distinguished honor of entertaining this organization that former President Roosevelt has so aptly called, "the greatest development agency of the country." As long ago as 1907, when the fifteenth congress met at Sacramento, Cal., delegates will remember there was insistence on the part of this great second city of Colorado for the honors. But Albuquerque was there with greater organization and was successful. Again at Albuquerque, in 1908, Pueblo sent its splendid delegation and band to the thriving New Mexico metropolis with another invitation. Spokane had carefully mapped out its campaign, however, and the congress went there, and in August last year held what had been, up to that time, the most successful gathering of the congress. Last year, at Spokane, Pueblo went with determination and a rousing delegation to capture the big event it had so long desired, and it was successful.

Pueblo Accomplishes a Great Task.

It is not too much, perhaps, to say that Pueblo went about the work of arrangement for what it appreciated would be a great task, a little earlier and a little harder than any of its predecessors. Early in October, the board of control was formed, and early in November the offices opened in the Central block at Pueblo. From then on, a most active and energetic campaign was prosecuted, to the end that now, as these lines are written, the work of organization and publicity have gone forward with more gratifying results than ever before at a like time preceding the annual sessions.

The board of control of the eighteenth congress is larger than any of those preceding it. It numbers sixty-five. Of this number forty are residents of Pueblo, and twenty-three from the state of Colorado at large. Three are from western Kansas, from the far-famed lower Arkansas valley, and from the town of Garden City that stands out as the capital of the lower valley even as Pueblo

is of the valley as a whole, and that is the center of a vast irrigated area where pumping is in vogue.

It is perhaps too much to undertake to review in detail the personnel of the board of control, numbering as it does so many. The chairman is P. J. Dugan, known all over Colorado and the West as a foremost authority on land, irrigation, and mining law. He has been active in local affairs and is peculiarly fitted for the position.

The vice-chairman of the board is A. G. Watson, an active man in the commercial organization life of the town, a delegate to Albuquerque in 1908, and the Pueblo leader at Spokane in 1909. He is past secretary of the state fair association, and has been a director of the Colorado commercial association.

The secretary of the board of control and also its director of publicity is R. H. Faxon, editor of the Evening Telegram, Garden City, Kan. Mr. Faxon has been a delegate to the several congresses, twice secretary of the committee on resolutions, and was active in the Pueblo campaign at Spokane.

The treasurer of the board is Alva Adams, three times governor of the State of Colorado, one of its most distinguished citizens, and a leading resident of Pueblo, where he has lived for more than a third of a century.

The executive committee is composed of thirteen members, and has done a great work in behalf of the congress. Besides the four officers above enumerated, it includes:

Asbury White, one of the leading merchants of Pueblo; George D. Meston, who was one of the Pueblo delegation at Spokane and whose chief work this year has been the erection of the splendid Congress Hotel that will play so important a part in the congress deliberations; W. D. Keen, president of the Real Estate Exchange, and one of the active men in the commercial organization life of the town; C. K. McHarg, secretary of the principal ditch association in the Pueblo district; P. J. Byrnes, an editor and publisher of Pueblo; C. W. Daniels, a retired merchant and a heavy owner of irrigated and improved lands; J. A. Barclay, manager of the Chieftain; F. S. Hoag, manager of the Evening Star-Journal; and J. S. Greene, former state engineer and a well-known consulting engineer.

Among others who are members of the board of control are:

Senator Simon Guggenheim, Representative John A. Martin, Governor John F. Shafroth, Mayor A. L. Fugard, Professor L. G. Carpenter, head of the engineering department of the State Agricultural College, and former state engineer.

The board has met frequently and counseled together in an interesting and profitable way.

Entire State Is Aroused.

Pueblo's chief desire in the matter has been to make the eighteenth session of state-wide importance and character, and to this end, the entire state has been aroused and organized. This broad spirit on the part of Pueblo as the entertaining city, and bearing the brunt as it must, may well act as precedent to future entertaining cities.

The national officers of the congress are such as to inspire the closest attention and consideration, and the most complete confidence.

The president is B. A. Fowler of Phoenix, Ariz., former secretary of the congress, president of the Salt River Water-Users' Association, and one of the foremost men in the congress work for the past decade.

The secretary is Arthur Hooker, an active, alert young man from Spokane, who was secretary last year of the board of control, and whose heart is in his labor.

The chairman of the board of governors—the executive committee of the executive committee—is R. Insinger of Spokane, who made such an admirable chairman of

the board of control last year, and who is one of the really big men of the Pacific-Northwest.

The first vice-president is R. E. Twitchell of East Las Vegas, New Mexico, who was secretary of the board of control at Albuquerque two years ago and later third vice-president. He is one of the foremost men of the great Southwest, and an active worker.

The second vice-president is Major R. W. Young of Salt Lake, long in the congress work, often chairman of

S. C., commissioner of agriculture, etc., of his state, and who won his spurs by interesting and taking to Spokane last year twenty-six delegates from his state in a special car.

The foreign secretary of the congress, who has done effective work for the past three years, is Dr. E. McQueen Gray of Albuquerque, N. M., president of the University of New Mexico, and a noted scholar, linguist, and son of a former diplomat.



OFFICERS OF THE NATIONAL IRRIGATION CONGRESS.

1. Arthur Hooker, Spokane, Wash., Secretary 18th National Irrigation Congress.
2. Benjamin A. Fowler, Phoenix, Ariz., President 18th National Irrigation Congress.
3. R. Insinger, Spokane, Wash., Chairman Board of Governors and Executive Committee of the 18th National Irrigation Congress.
4. P. J. Dugan, Pueblo, Colo., Chairman of the Board of Control, 18th National Irrigation Congress.
5. R. H. Faxon, Garden City, Kan., Secretary of the Board of Control and its Director of Publicity, 18th National Irrigation Congress.
6. A. G. Watson, Pueblo, Colo., Vice-Chairman Board of Control, 18th National Irrigation Congress.
7. Mineral Palace, Pueblo, Colo., Where the 18th National Irrigation Congress Will Be Held, from September 26th to 30th.

the committee on resolutions, and who was a delegate as a very young man at the first congress held in his home city in 1890.

The third vice-president is L. Newman of Havre, Mont.

The fourth vice-president is Colonel F. W. Fleming of Kansas City, prominent in the big work of the West.

The fifth vice-president is E. J. Watson of Columbia,

Enough has been said of the character of the location for the next congress, with its significant facts as to irrigation, and of the personnel of the officers of the congress, to insure and set down as certain the fact that the congress is in good hands and well chosen as to place.

Only one month ago, the board of governors of the congress met at Pueblo in a 4-day session, and thoroughly

(Continued on page 478.)

PUEBLO: THE HOST CITY.

Pueblo Is "The Gateway to the Mountain West." "All Roads Come to Pueblo. the City of Sunshine."

PUEBLO, the host city for the Eighteenth National Irrigation congress, is the second city in size in Colorado, eclipsed only by Denver. Its population is in excess of 50,000. It is the third city in size in the Mountain-West, only Denver and Salt Lake surpassing it.

Pueblo gets its name from the tribe of Indians by that name, which was the first agency in this country, so far as known, to practice the art of irrigation. Long before the Spaniard came to the Great Southwest, the Pueblo Indian had his system of agriculture and irrigation, crude, yet effective. Hence the significance of the great city of Pueblo entertaining this year the Irrigation congress.

Pueblo is "The Gateway to the Mountain-West."

Through its portals pass the great transcontinental trains, bound for the East, the West, the North, the South. Its position is strategic, and its supremacy is assured.

Pueblo is the capitol of the famous Arkansas Valley of Content, and tributary to it, therefore, is a splendid

were validated at Pueblo. Pueblo is the best distributing point in Colorado. It is the only natural location for gathering raw material in the Rocky Mountain region; hence the only manufacturing center.

Pueblo, the Manufacturer.—Pueblo is the great manufacturing city of the Rocky Mountains. Its steel works, smelters, brick plants, saddlery establishments, candy factories, foundries, machinery and implement plants, tent and awning and mattress factories, and its many other plants, produced in the year 1909 more than 50 million dollars of finished products; an output greater than many states. Pueblo's monthly pay-roll is $1\frac{1}{2}$ million dollars, and it has 20,000 workmen. Among the lines still open are: Boots and shoes, woolen goods, stoves, glass, wool-scouring, and overall and shirt factory.

Coal.—Pueblo is peculiarly fortunate as to coal. Right at its doors are the only great coal fields of the West. The quality is superior to any other. Within 75 miles to the south and 40 miles to the west, the supply is inexhaustible. Three-fourths of the coal used in a radius of 500 miles comes from Pueblo coal fields.

Agriculture.—While long known as "The Pittsburg of the West," from its strength as an industrial center, Pueblo is more and more becoming the center of a splendidly developed agricultural country, under irrigation.



Pueblo County's New Court House.

agricultural area with more than a half million acres under water and nearly as much more assured irrigated area within the next year. This great area produces almost every known variety of agricultural or horticulture, and Pueblo is the mart of not only the valley but of western Kansas, northern New Mexico, and even Utah.

The great factor in the upbuilding of Pueblo, the force that will take hold of its work of the future, is the Pueblo Commerce club. This important commercial body has a membership of more than 500, divided into bureaus, and is working hand in hand with the board of control of the Eighteenth National Irrigation congress. Few towns in the West have such effective agencies for the performance of the town's work as the Pueblo Commerce club.

The Pueblo Territory—Pueblo's Exclusive territory covers 200,000 square miles of growing country. It is a great commercial, industrial and railroad center. Its trade territory covers southern Colorado, northern New Mexico, northwestern Texas, northwestern Oklahoma, and western Kansas. Its business extends also to the famous Western Slope of Colorado, across the Great Continental Divide.

Pueblo Railroads.—Pueblo is a great railroad center. This industry employs 4,400 men, and $12\frac{1}{2}$ million dollars is paid in freight annually. In 1909, 25,000 tourist tickets

Pueblo is the capitol of the famous Arkansas Valley, aptly termed, the "Valley of Content." This valley extends 275 miles, from Canon and the Royal Gorge of the Arkansas to Garden City, Kansas. Sugar beets, alfalfa, celery, fruit, cantaloupes, truck, wheat, corn, cattle, and sheep are making the farmers of the Arkansas Valley rich. Sugar beets produce \$75 per acre, and other crops in proportion. In addition, the new fruit section, the farm and stock lands, of the Western Slope, the San Luis Valley, the Durango and Farmington regions are directly tributary.

Stock Interests.—Pueblo is the natural depot for the stock interests of a vast region. This territory ranges from western Utah to southern New Mexico. Pueblo stock yards and buyers handled in 1909, 750,000 sheep; 140,000 cattle; 14,000 horses, and 10,000 hogs. With the constant increase of alfalfa production, the stock industry is in its infancy, and the hog industry especially is making a marvelous growth.

Internal Improvement.—Pueblo has in recent years entered upon a magnificent campaign of internal improvement. A great storm sewer system has been put in at a cost of \$400,000. Many miles of asphalt pavement have

been laid. Eighty miles of cement sidewalk have gone down. Residence pavement, one district having a frontage of fifteen miles, is under way. The seven banks of the town have more than 12 millions of deposits, and in addition there are a number of private banks and building and loan associations. Pueblo capital has done the financing of much of the southern Colorado development in recent years.

Wholesale and Retail Trade.—Pueblo has 36 jobbing houses which do an enormous business. There are many lines yet open. Wholesale dry goods, millinery, notions, clothing, hats and caps, are some of them. Retail stores are up-to-date and supply not only local trade but that of surrounding territory. Dry goods, clothing, furniture, hardware, crockery, and all staples attract buyers from a radius of from 100 to 150 miles.

lection of Colorado minerals. The building is visited every year by thousands of tourists.

Public Schools.—These justly occupy a high rank. The city has 24 public school buildings, including two splendid high schools with 780 students, one college, two commercial colleges, three schools of music and art and several academies. The high schools of the city are among the best in the United States and admit to the leading universities.

State Fair.—Pueblo is the permanent home of the Colorado State Fair, now grown to be a great exposition with ample buildings and grounds.

Pueblo Parks.—These are a constant source of pride. There are 19 of them scattered all over the city. Mineral Palace Park and City Park are notable, and are admired by thousands of visitors.

Public Utilities.—Pueblo has splendid public utilities.



1. Main Street, Pueblo, Colo.
2. Union Avenue from Union Depot Viaduct, Pueblo.
3. View in Mineral Palace Park, Pueblo.
4. Federal Building, Pueblo.
5. Elks Club, Pueblo.
6. Lake Clara in Mineral Palace Park, Pueblo, Colo.
7. City Park Gate, Pueblo, Colo.

Pueblo Architecturally Important.—Pueblo has splendid paved streets and fine business blocks. The Grand Opera house is one of the finest in the country and cost \$350,000. The McClelland Library cost \$100,000 and has 30,000 volumes. The Federal building is an impressive structure of grey brick. A new Court House costing \$600,000, is nearing completion. The great group of buildings of the State Insane Asylum are in a beautiful park in the western part of the city. The Mineral Palace, a pure white building of noble architecture in which the great Eighteenth National Irrigation congress will hold its sessions, cost \$250,000, and contains an unexcelled col-

It has electric street car service with 35 miles of track; two water plants owned by the city; a telephone system with 4,600 telephones; a gas plant; an electric light plant, with power at a local plant in this city as well as with water power plant in the mountains 50 miles away.

Citizenship.—The splendid citizenship of Pueblo is exemplified by the physical improvements of the city, the parks, the public utilities, the newspapers, the colleges, theaters, churches, residences, drives, beauty-spots at frequent intervals, paved streets, schools, and progressive work. Pueblo is building a city on a broad and generous basis.

Scenic Beauty of Colorado

After the Eighteenth National Irrigation Congress is Over Delegates Will Have an Opportunity to Enjoy It.

By RALPH H. FAXON.

A WAY back in the sixties, just as the old Kansas Pacific, now a part of the Union Pacific railroad, was being pushed westward from Kansas City to Denver, Bayard Taylor, in writing up Colorado, first made use of the expression, "It is the Switzerland of America."

Theodore Roosevelt has called it "The Playground of America."

Seldom have delegates to a National Irrigation congress or the visitors who generally compose the attend-

Canon City, the first step is entrancing. The upper waters of the Rio Grande river and the almost equally famous San Luis valley furnish a most pleasing experience, and to the east Sierra Blanca lifts itself 300 feet higher than Pike's Peak, always snow-capped, and standing like a sentinel at the entrance to this wonderfully fertile section in southern Colorado.

To the north of Pueblo the more traveled paths lead to Colorado Springs, Pike's Peak, the splendid short line to Cripple Creek, Manitou, with its famous waters, nestling at the foot of Pike's Peak, and the Garden of the Gods, now a part of the Colorado Springs park system hard by.

Still further north comes the beautiful city of mountain and plain, Denver, from whence the wonderful Moffat road trips and the Georgetown Loop may be taken with pleasure and profit, and still further northward is Long's Peak, one of the trio of lofty sentinels that guard the way along the Continental Divide. The beautiful town of Boulder, and innumerable other retreats, large and small, are to the north of Denver, and furnish opportunity for the



The New Congress Hotel, Pueblo, Colorado.

ance at such sessions, had an opportunity for mingling pleasure with profit to such a nice extent as they will have when the eighteenth National Irrigation Congress shall have passed into history on September 30, 1910, and they set about to determine what next they shall do before leaving for their homes.

Still better opportunity, perhaps, is presented to those

greatest possible enjoyment.

The Western Slope is replete with revelation and beauty. It is almost as satisfying to see an acre of apple orchard that is worth from four to five thousand dollars as it is to see the Palisades and the beautiful formations in the Grand River valley along the scenic route that traverses it.



The Pueblo Central High School.

from the far East or from the South, unacquainted largely with the possibilities of Colorado, to go to that state late in August or early in September and enjoy these advantages before the opening day of the congress on September 26.

From the entrance into Colorado and the journey up the famous Arkansas Valley to the congress city and thence to the wonderful Royal Gorge of the Arkansas, at

There are two particularly splendid trips that may be taken out of Colorado Springs that are worth the while of any idling tourist or busy man with but a few hours at his command. One of these is "Pike's Peak by Rail." This is over the "Cog-wheel Route," a feat of engineering that permits a specially-constructed Baldwin engine to haul a large car filled with people up grades of very high percentage with perfect safety to a view that is

probably not surpassed anywhere on the continent. The fact that this road has been in operation for twenty years and that no harm has yet come to the traveler is certain indication of its availability by even the most timid person.

Pike's Peak is called "The Monument of the Continent," and this is certainly a fitting term, for Indians and frontiersmen and pathfinders and tourists have all, in their day, looked with eager eye on this mark that first



Pueblo County Beet Field.

broke the march of civilization westward, and that stood as a guide, philosopher and friend on more than one occasion.

Pike's Peak is a history and a romance. Major Zebulan M. Pike, a soldier and adventurer, discovered it November 13, 1806, and attempted to ascend it. He and his

most famous gold camp, leave the traveler with a mingled sense of awe and sheer pleasure.

At the Cripple Creek end of this trip there is what is known as the Electric Circle tour. This passes the back doors and the front doors of all the big mines in the district, and it is illuminating and entertaining to any stranger to have a look at close hand at the mines of which he has so long heard and which are such wonderful producers.

One of these is the Low-line and the other the High-line. The Low-line has the more mines along its way, but the High-line scales mountains and goes through Midway, Independence and Goldfield, all thriving mining towns. The great scarred mountains tell the story of the tunneling and digging, of the lives that have been lost and the treasure gained, but of an industry that seems just as prominent now as it was in the exciting days of gold discovery in that district.

At Canon City, where the Royal Gorge of the Arkansas presents a scene only equalled on this continent by the Grand Canon of the Colorado or Yellowstone, one may find very great pleasure indeed. The Skyline drive is not equalled anywhere in this country and only at one place in the world, at Caracas. Canon City should be on the list of all Colorado pleasure seekers.

Picturesque, scenic Colorado plus all its mineral deposits, and its wonderful agricultural attainments under irrigation, and plus the greatest gathering held in the west this year, make it worth the while of anyone to tarry for a month.

Foreign Representation at the Congress.

Not least of the splendid features of the Eighteenth National Irrigation Congress, Pueblo, Colorado, September 26-30, 1910, is the factor of foreign representation.

It is the opinion of Dr. E. McQueen Gray of Albuquerque, New Mexico, the industrious and exceedingly accomplished foreign secretary of the congress, that the



The Minnequa Plant—Pueblo's Great Steel Works.

men tried it time and again and while they did not reach its top, they carried back the word of it and today it bears the soldier's name and a plate suitably inscribed on its summit is a monument to him as much as the stone that rests in the beautiful park near the Antlers Hotel at Colorado Springs.

The trip up the road to the summit is not to be described idly. It is a thing that must be undertaken to be appreciated. The narrow defiles, the steep grades, the look into canyons and gorges, thousands of feet deep, the approach to timber-line, the winding way around the summit until the top is finally reached, are exhilarating, inspiring, satisfying.

The short-line trip over the range to Cripple Creek out of Colorado Springs, is one that cannot be overlooked in the log of any traveler. This road, built less than 10 years ago, a distance of 45 miles, at a cost of 20 million dollars, is an engineering feat as daring and as successful as the cog-wheel road itself. The trip is a continuous panorama through canon and mountain scenery, starting at an altitude of 6,000 feet at Colorado Springs, and working up to 10,000 feet at Summit.

The scaling of mountain sides, the tunneling through precipices here and there, the spanning of canons and gorges, the double "S," the constant winding round and round the mountains, and the final descent into the world's

foreign representation will be from 35 to 40, in number.

This representation will include the leading countries of the world, not only Europe, through its diplomatic and governmental representatives, but Asia, the Republic of Mexico, South and Central American republics, Canada, Cuba, and other nations.

Canada was the first to name these foreign delegates, and they include, five in all, irrigation and engineering officials of different provinces.

The Republic of Mexico was next in line. The secretary of state, Enrique Creel, former ambassador to the United States, informed Secretary Gray that a distinguished representative would come from that country.

Dr. Gray is now engaged in the endeavor to secure some distinguished diplomatist—preferably, Ambassador Bryce—and also a noted French engineer from the department of public works of that country.

The foreign representation was first taken up two years ago in the Sixteenth National Irrigation Congress at Albuquerque, and has grown to be one of the most interesting features of the congress.

Meanwhile, Secretary Arthur Hooker of the national organization continues to receive lists of delegates in increasing numbers, and the gratifying thing to him is the high character and degree of prominence of the men named on the state delegations by the different governors

"The Valley of Content"

In This Famous Section, the Capital of Which Is Pueblo, the Eighteenth Congress Will be Held.

A NEWSPAPERMAN, one of the high priests of this wonderful section has aptly called the Arkansas valley "The Valley of Content."

The name has made good. Today, scarcely anyone in the valley calls it "The Arkansas Valley." Instead, he says, "The Valley of Content."

And it is, in very truth, the Valley of Content.

Throughout its 306 miles of length, and its varying width of from two to five miles, the irrigated Arkansas valley stretches its sinuous way in perfect peace and contentment. Today, whatever conditions elsewhere, however unfortunate certain sections of the West may have been as to water, the Valley of Content is smiling and happy. It gets a little better each year, and not the least of its pleasures this year is the fact that the eighteenth National Irrigation Congress is to meet at its capital, Pueblo,

seven crops are annually cut. Some way, the alchemy of the soil and sunshine perhaps being the contributory causes, the alfalfa is a little more dank and lush, a little more plentiful and profitable, a little more succulent, the seed a little more sought for, in the valley than elsewhere in the land. The seed crop is a great one, especially in the Garden City, Kansas, district, that town being the foremost seed market for alfalfa in the world.

Of beets, there are in the neighborhood of 75,000 acres in the Valley of Content. This makes an average of more than 10,000 acres for each mill, for there are seven fine beet sugar mills in this splendid domain. They are located at Rocky Ford, Swink, Sugar City, Lamar, Las Animas, Holly, in Colorado, and at Garden City, Kansas. Four companies are represented. The American Beet Sugar Company, which owns the mills at Lamar, Las Animas, and Rocky Ford; the Holly Sugar Company owning the mills at Holly and Swink; the National Sugar Company owning that at Sugar City, and the United States Sugar and Land Company owning that at Garden City.

Fruit is raised in abundance in the Valley of Content. One county alone, Fremont, the county seat of which is Canon City, produced last year more than a million dollars worth of apples, and a quarter of a million dollars worth of small fruit. Fowler, Rocky Ford and Garden City are also great fruit districts.



New Hotel Vail, Pueblo, Colo.

the second city in size in Colorado, and the third in the Great Mountain West.

The Valley of Content has more than a half million acres under water. It embraces every known kind of irrigation, from the open ditch to the perfect type of sub-irrigation by means of concrete pipe; from the earliest forms of irrigation to the latest; from gravity to pumping. At the upper end of the irrigated Valley of Content sits the beautiful little town of Canon City, enthroned amid the scenic grandeur of the Grand Canon of the Arkansas. At the lower end is Garden City, that beautiful, thriving little town of 4,000, in Kansas, with its full development under pumping, and with the towns of Cimarron and Dodge City just below it, themselves becoming the centers of added irrigation to the eastward in the valley.

This more than one-half million acres under water in the Arkansas valley will be added to within the next year by almost a like amount of irrigated area. Projects are already under way, and will be soon completed, many of them. The fame of the Valley of Content is great indeed, leading thousands to view it with increasing delight each year, and making it more and more the perfect type of irrigation and intensive cultivation.

The three great crops of the Valley of Content in Colorado and Kansas are beets, alfalfa and fruit. There are more than 100,000 acres of alfalfa, from which four to

Truck is raised in great quantities. The famous Rocky Ford district raised last year more than a million dollars worth of cantaloupes. Celery, potatoes, watermelons and other truck abound.

There is no section of the country coming more rapidly into intensive cultivation than the Valley of Content. The small areas are constantly increasing. The old cattle days gave way to quarter-sections. These dwindled to 80-acre farms; then to 40-acre tracts; then those of twenty and ten acres, and celery and sweet potato tracts of from one to five acres are many indeed.

A factor in the complete development of the Valley of Content is the Valley Commercial Association. This is the merger of commercial clubs of the valley. The number of local bodies included in the federation is now twenty-two—seventeen in Colorado and five in Kansas. The membership extends from Canon City, Colorado, to Dodge City, Kansas. The organization was formed the first of this year, and the work has been great already, with many campaigns planned. This association has pointed the way for many others which have since been formed.

The president of the Arkansas Valley Commercial Association is R. H. Faxon, of Garden City, Kansas. The vice-president is H. S. Maddox, of Canon City, Colorado. The secretary-treasurer is L. R. Fenlason, of Rocky Ford, Colorado.

MANY NEW HOMES WAITING.**Second Unit of the Belle Fourche Project in South Dakota Open for Entry.**

The completion of the second unit of the Belle Fourche irrigation project in South Dakota makes available for homestead entry, 132 choice farms of forty and eighty acres each.

The farms are open to entry under the general provisions of the Homestead Law and the Reclamation Act. The settler is required after visiting the land to make his homestead entry at the local land office at Rapid City, or before the United States Commissioner at Belle Fourche.

The homestead entry must be accompanied by an application for water right. There was no lottery. In addition to the nominal entry fee the settler must pay in advance one-tenth of the building charge, or three dollars per acre of irrigable land.

A charge is also made of forty cents per acre per annum for operation and maintenance. The initial payment for a 40-acre farm will be about \$142, and for an 80-acre farm, \$279. This is one of the lowest priced water rights in the West, and it is expected that every farm unit will be taken up before May 1st.

The irrigable lands are located in Butte and Meade

All the fruits and vegetables that can be raised in the valley can be sold to the mining camps of the Black Hills, where employment is given to thousands of men. Milk, eggs, butter, poultry, and garden truck all bring high prices and there is a growing and constant demand for these products.

Sturgis, Whitewood, Belle Fourche, and other towns have direct connection over the Chicago & Northwestern Railroad with Omaha, Minneapolis, St. Paul, Chicago, and other large cities. These great markets take all the sur-



Belle Fourche Valley and Canals.

plus products, sending in return machinery, household supplies and other manufactured articles not yet produced in the valley. A new railroad is being built the entire length of the project, so that the transportation facilities will be excellent.

The reservoir created by this dam will cover about nine thousand acres, and will be the largest lake in the state. It will receive water through an inlet canal $6\frac{1}{2}$ miles long, 40 feet wide on the bottom, and capable of carrying the entire flow of Belle Fourche River.

The Belle Fourche offers opportunities in every line



Small 20-Acre Farm Being Profitably Farmed One Mile West of Spearfish, S. D.—Belle Fourche Project.

counties, north and northeast of the Black Hills, one of the richest gold mining camps in the West.

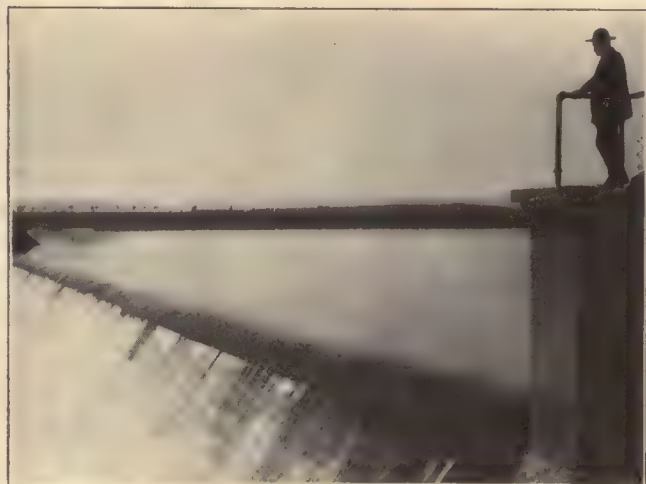
The average elevation of the lands under the Belle Fourche project is 2,800 feet above sea level. The climate is healthful and invigorating. As in other parts of the arid region, the sensible temperature does not vary greatly, owing to the dryness of the atmosphere.

The soil is clay loam and sandy loam, exceedingly fertile and free from alkali. Fruits, such as apples, cherries, plums and small fruits, do well, especially on the higher portions of the project near the bluffs, and potatoes produce abundantly on the south side of the river where the soil is more sandy.

Sugar beets raised in the valley, it is claimed, contain as much sugar as those raised in any other section of the country, and are profitable as a special crop.

The vast open country surrounding the valley affords pasturage for immense herds, making that section one of the largest cattle ranges in the United States. As many as 5,000 car loads of cattle have been shipped from Belle Fourche in a year.

Large flocks of sheep also feed on the ranges, and one and one-half million pounds of wool are shipped annually from this region. With the irrigation of the valley and the production of abundant crops of small grain and alfalfa, a new and important industry will be developed in the winter feeding and fattening of stock.



Diversion Dam Looking South—Belle Fourche Project.

of business. The valley is practically a virgin field. The mercantile pursuits are not overcrowded. Manufacturing is yet to be developed, and the professional man has a great opportunity.

The reclamation of 100,000 acres of land included in this project, with a family on every forty or eighty acre tract, will necessitate the establishment of several new towns and will add greatly to those now in existence.

ARID AGRICULTURE

BY

B. C. BUFFUM, M. S.

Manager of the Wyoming Plant and Seed Breeding Company, Worland. Former Professor of Agriculture in the University of Wyoming and the Colorado Agricultural College, and Director of the Wyoming Agricultural Experiment Station.

CROP MANAGEMENT.



PROF. B. C. BUFFUM.

Some of the most resistant crops to drouth are macaroni wheat, kafir corn, sorghum, millet corn, potatoes, alfalfa, brome grass, wheat grass, spelt, beans, winter rye, sainfoin, peas, vetches and Jerusalem artichokes. Crops may be resistant to other things of importance as well as drouth resistant. In parts of the arid region there are streaks where hail storms are more or less frequent. Some plants will withstand the effects of hail much better than others. A heavily bearded grain like macaroni or Durum wheat or

Turkey Red wheat will not be so badly injured by light hail storms as will other kinds of grain. Flax is a good hail-resistant crop and sugar beets will recover after severe hail storms have practically pounded them into the ground.

Farmers are also coming to appreciate more and more disease resistant crops. It seems important that we should produce potatoes resistant to root rot and blight. Some varieties seem more resistant to these diseases than others but the matter has not been fully enough worked out to make definite recommendations. We are working on the leaf-spot disease of alfalfa with hopes of securing immunity from destruction by this disease.

Good seed, good land and good farming require good

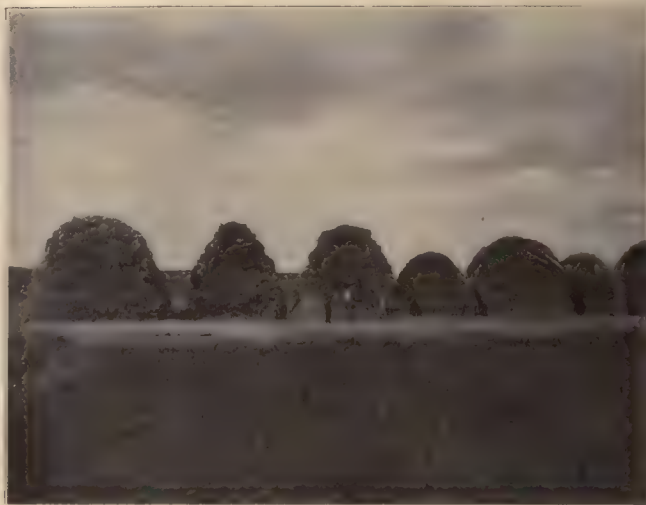


Dr. V. T. Cooke and the Beardless Feeding Barley—Raised by Dry Farming.

planting. Special machines for planting are as important as plows or other implements for preparing the ground. Grain sown broadcast or potatoes planted by hand are at the risk of the farmer and at the best can be expected to give only indifferent returns. Grain that is broadcasted and harrowed or cultivated to cover, is never well planted. The work is all unevenly done. Some of the seed is covered too deep—some not deep enough—the soil is not packed around the seed—the plants do not have the ad-

vantages of light, air and the cultivation they get in the drill rows.

The press drill is an essential implement for the dry farmer and will pay for itself in a single season on any average sized farm of the West. It plants the grain evenly, at a proper depth, puts it in contact with moist soil and presses the soil around the seed in a way which secures quick and strong germination of the seed and the best early growth of the seedling plants. A week or ten days is gained in the season by this prompt germination and quick growth. There is a large saving of seed which is an important item. Forty pounds of seed press-drilled



Alfalfa Stacks on Government Farm, Cheyenne.

is equal to sixty pounds sown broadcast, a saving of 33 per cent.

Planting fall or winter grains secures advantages to the farmer over sowing spring crops. They have a long season and usually will mature before drouth sets in. Only the winter wheat, winter rye and winter emmer are hardy enough in our northern arid region. Winter oats have been grown as far north as northern Wyoming east of the mountains, but the varieties now used cannot be depended on to produce a crop. Winter barley is being tried but it cannot be recommended as successful yet. Winter rye and Turkey Red wheat give surprisingly good results. Near Cheyenne these grains stood a winter of unusual drouth, there being only one and one-third inches of precipitation in eight months. After standing this remarkable drouth, winter rye produced 44 bushels and winter wheat 35 bushels per acre. The author is breeding winter emmers for the arid region and these grains give promise of revolutionizing the stock-feeding industry of our western plateaus. Sow winter grain on summer tilled land in September or the first half of October. At lower altitudes on irrigated land some farmers have sown wheat any time up to the hard freezing weather with success. Where fall sown grain can be pastured it may be planted earlier.

Spring sown crops should be planted as early as the ground can be made ready and danger of heavy freezing is over. Catch or volunteer crops sometimes yield enough to be of value from seed that shatters off in the fall.

Much of the success of dry farming depends on thin seeding. More beginners in dry farming sow too much seed rather than too little. Where grains are sown early and have a correspondingly long season, there is more chance for stooling. For the same reason we should sow larger amounts of seed when we are late doing the work. There may be moisture enough to support ten grain plants per square foot when twenty plants would die of thirst. Limited moisture therefore calls for thin planting that there may be less danger of "firing" before the crop matures. If the season is well advanced and the soil moist and warm so grains shoot up rapidly they do not take time to stool or make tillers. The reason that some grains are more drouth resistant than others is that they have grown in dry regions so long they have lost the habit of tillering

to a large extent and also produce less leafiness to pump moisture from the soil. The following seed table will be found very useful for dry farming. The amounts of seed given are based on the very best condition of seed bed, planting at the right time and with a drill which does the



"Coming Through the Rye." The Wyoming State Dry Farm Commission.

work in the best possible manner. The farmer whose seed bed is in poor tilth or dry, or who plants late or with poor methods, should increase the amounts of seed recommended by from 30 per cent to 100 per cent.

CROP.	Remarks.	Minimum Seed per Acre Pounds.
Alfalfa	For hay, drilled.....	10
Alfalfa	For hay, broadcast.....	25
Alfalfa	For seed in wide rows.....	2
Canada Field Peas.....	(Small)	40
Field Peas	(Large varieties)	50
Sand Vetch .....	.....	20
Millet	Siberian	8
Millet	Common or German.....	5
Proso	Drouth-resisting Broom Corn Millet	6
Brome Grass .....	.....	20
Meadow Fescue .....	.....	15
Western Wheat Grass.....	.....	20
Slender Wheat Grass.....	.....	35
Barley	For threshed grain.....	50
Barley	Beardless for feed.....	35
Oats	For grain	60
Oats	For hay	30
Rye	Winter or Spring.....	30
Winter Wheat	Drilled	40
Durum Spring Wheat.....	Drilled	60
Polish Wheat	For feed	40
Emmer or Spelt.....	For feed	20
Buckwheat .....	.....	25
Flax	For seed	50
Flax	For fiber	2
Broom Corn .....	.....	20
Field Beans	(Small)	4
Corn	In hills and thin.....	7
Corn	In drills	10
Sweet Corn	For fodder	8
Sorghum	For seed	20
Sorghum	For fodder	4
Kafir Corn .....	.....	2
Turnips .....	.....	3
Carrots .....	.....	6
Mangel Wurzel or Stock Beets.....	.....	20
Sugar Beets	To be thinned.....	

The best seed, regardless of cost is the most profitable. The cost of good seed is small compared with the value of the resulting crop. The difference in the price of first and second grade seed does not make a great

difference in the total cost per acre. Like produces like. The best seed invariably results in the best crop. It is especially important that the dry farmer plant thoroughly clean seed that is free from weeds. We know of nothing that causes greater loss than the presence of worthless weeds. They rob the soil of its moisture and use plant food that belongs to the crop.

Without exception every student of western farming recommends the use of seed that is acclimated or that has been grown under the same conditions as those where they are to be planted, or as near these conditions as is possible to obtain. This subject of the breeding of varieties suitable to our western conditions and the adaptation of plants to soil and climate is one of the most important with which we have to deal. As a rule seeds raised under irrigation or in a humid climate are not good seeds for dry farming. Good seed cannot be produced as cheaply or sold for the same price that common bulk crops bring. With the breeding work that is now inaugurated in the arid region it will be but a few years before new and improved varieties of farm seeds will be made available. This work cannot fail to make our western farming more successful and profitable.

The principal implements for cultivating grain are the drag harrow and the weeder. When the grain is too high to be harrowed a weeder may then be used to much advantage. Sometimes the weeder may do the best work from the first. To do the work properly the harrow teeth must be kept sharp and slanted. Good work cannot be done with dull or stubbed-off teeth. Always harrow crossways of the drill marks if possible to do so. It often looks as though great injury were being done by harrowing small grain, but it never fails to turn out beneficially. Winter wheat should be harrowed one or more times in the spring going over twice may be necessary to do effective work. Small grains or even corn may be harrowed until six or seven inches high. The harrow is a good thing to run over the potato field or field peas just when they are coming up.

Of course the harvest may be carried on by ordinary methods, but the soil should not be neglected at this time. Where our rainfall comes during the summer, discing the stubble after harvesting grain is important. After harvesting potatoes or sugar beets the drag harrow should be used to break up the lumps and re-establish the soil mulch. Barley or other grains that can be used for feed without threshing should be harvested when in the stiff dough. This prevents, in a measure, re-seeding the ground through the grain shattering out, for in this country practically all the ripe grain which drops on the ground in the fall comes up the next spring as a volunteer crop. If the grain can be fed without threshing it is marketed in the best possible way from the farm and saves the cost of threshing and handling.

Pure grain farming is not the best type of permanent agriculture. On suitable soils, however, both with and without the summer-fallow system, farmers have practiced grain farming on the same soils for more than thirty years in parts of the West and they have become thrifty and even wealthy doing so. There is no doubt but such soil robbery will result in depletion in time, but the extensive grain farmer gives little or no thought to the building up of a productive farm for future generations. He often expects his children to enter the profession or move to some other country for their livelihood. With the practice of growing a single crop year after year, continued long enough, at the same time adding nothing in plant food, there are few soils upon which, sooner or later, farming will not become unprofitable. Confining the soil to one crop induces the accumulation of insects and plant diseases, which are peculiar to that crop, and when the devastation arrives it hits quick and hard. When grain farming is the principal aim in any region, the best practice in addition to the resting of the soil alternate seasons, is to adopt a system of crop rotation which will add fertility.

Rotation of crops is not so necessary where land is summer tilled every other year as it is to keep up soil fertility on lands that produce annual crops. However, a regular system of rotation will pay on all dry farms. The principal aim in a rotation for arid lands, is to keep up

(Continued on page 478.)

Homes in Fountain Valley

What One Energetic Man, Wm. C. Johnston, Has Accomplished in a Famous Colorado Section.

WHEN the history of reclamation work in the state of Colorado has been prepared and the promoters of the larger projects are given due recognition, it is safe to say that the name of William C. Johnston, of the Fountain Valley Land and Irrigation Company (who is also the father of the Castlewood, now known as the Denver and Suburban Homes Irrigation Company), will stand out especially prominent.

Mr. Johnston is a man of great force and an active promoter of large institutions. He is a Southerner by



View of Main Canal of Fountain Valley Land & Irrigation Company's Project—2 Miles from Colorado Springs.

birth and has made his home permanently in Colorado Springs for some years past. He came into the country as a comparatively young man and has obviously not yet reached the summit of his ambitions. He has been purchasing from time to time large ranch properties throughout Fountain Valley south of Colorado Springs, and the work so far carried on on the Fountain Valley project, wherein many obstacles were encountered, demonstrates the dominant will of the man, and assures completion of this splendid project, which will stand as a monument to his activity, foresight and endurance.

At the present time Mr. Johnston is bending his energies towards the extension of this project by the additional purchase of lands as above stated.

In our November, 1909, issue there appeared an article on the Fountain Valley and the attractive project known by that name.

The center of activity in Fountain Valley is, at present, the town of Fountain, which lies thirteen miles south of the city of Colorado Springs. It is delightfully situated, commanding a magnificent view of the Rocky Mountain range, and is in close proximity to Cheyenne mountain, and from all of this property a fine view may be obtained of Pike's Peak, the San de Christo range, the Spanish peaks and the Green mountains on the south, with a sweep northwardly of some 100 miles of the main range of the Rockies.

It has been clearly demonstrated by ranchmen on this tract during the past two or three years that splendid crops of alfalfa, beans and small grains may be obtained, and Mr. Austin, who is in charge of THE IRRIGATION AGE ranch, near Fountain, has produced results upon his farm a little north of that town, which have given him fame throughout the district and the state.

The soil is said to be equal to the best in Colorado, and with proper irrigation all settlers in the Fountain Valley district should produce equally as good crops as

any of the older far-famed districts. In some respects this district combines advantages which are not equaled elsewhere. This is particularly true of the markets. Its main markets are Colorado Springs, Cripple Creek, Pueblo, and many of the mining towns lying on the railway lines westward from these points. It is a well known fact that the mining market is the best cash market in the world for garden truck as well as fruit. Leadville, which is one of the famous old-time camps of the Rocky mountains, is also tributary to this territory. The farmers in the Fountain valley can also compete successfully in the Denver market, which is only seventy-five miles away.

Within the last few months Mr. Johnston, president of the Fountain Valley Land and Irrigation Company, has made arrangements whereby a canning factory is now being established at Fountain, which will use much of the products at good prices, and will insure a home market without a long haul. This was a good stroke on the part of Mr. Johnston, and the people of the town of Fountain and the valley generally are to be congratulated on its successful outcome.

Many new homes have been erected on this tract within the past year and a half, and we are showing in this connection various scenes and views of these homes.

The Fountain tract has been settled largely, so far, by eastern people with means sufficient to erect substantial buildings and make all necessary improvements on their places without the delay usually incident in new settlements where the colonist arrives short of funds and frequently without the proper machinery with which to carry on his work.

There are ranches on the Morningside Hills, east of Fountain, which are as well equipped as any of the old ranches throughout the state, as will be seen by referring to the illustrations and legends accompanying them. Some of these homes are much better than are found on the ordinary old-time ranches.

We are showing also in this connection a large half-tone of a cherry orchard, set out by Mr. Johnson some three years ago. Part of this orchard, which will not come into full bearing for perhaps a year or more, sold recently for \$700 per acre. Assuming that the land with the water-rights and improvements, including cost of the tree stock, etc., cost Mr. Johnston \$150 per acre, it may easily be seen what profits can be made from setting out young orchards on \$125 or \$150-acre land.

The water supply for this tract of land is considered



View of Reservoir No. 3, Fountain Valley Land & Irrigation Company's Project.

by the best engineers to be fully capable of covering a much larger area. An examination of the reservoirs stored with water and a study of their capacity will readily convince anyone who is familiar with the subject of irrigation that there will be no shortage of water after the entire system is in operation.

(Continued on page 477.)



SCENES IN THE FOUNTAIN VALLEY, COLORADO.

1. Grader Working on Lateral on Fountain Valley Land & Irrigation Company's project.
2. View of Headgate from East Side—Fountain Valley Land & Irrigation Company's Project.
3. Building Fence on IRRIGATION AGE Ranch.
4. Residence of W. P. Larrabee—Fountain Valley Tract.
5. Load of Alfalfa Grown on the Skinner Ranch on the Fountain Valley Property.
6. There are Five Railway Lines—Four Stations on the Property.
7. Breaking out a Lateral on the Touzalin Ranch.
8. Home of Frank Schade, Whose Ranch Touches the IRRIGATION AGE Property on the Northeast.
9. Residences of E. H. and Hector Hofman Recently Erected on the Fountain Valley Tract.

The New Sante Fe Trail

History of a Great Enterprise that Follows the Path
Trode by Earliest Western Settlers.

"It is the greatest roadmaking effort in the West today." That was what the leading editorial writer on one of the biggest newspapers in the Middle West said to R. H. Faxon, of Garden City, Kansas, president of the New Santa Fe Trail, now building through Kansas and Colorado.



Union Depot, Pueblo, Colorado.

The New Santa Fe Trail hugs the main line of the Atchison, Topeka and Santa Fe railroad from Newton, Kansas, to Canon City, Colorado, a distance of about 500 miles, just as the Santa Fe railroad hugs the old Santa Fe trail, after which this splendid new highway was named. It has recently been extended eastward from Newton, Kansas, to Kansas City, and will now cover 700 miles.

Good roads is no new thing in the West, but the New Santa Fe Trail is the highest expression of the desire for a continuous good road that has yet been found in these parts. The Trail is the first definite, large project in road-making in the West.

The road is actually building, too. Commencing at Hutchinson, Kansas, it threads its way in a less circuitous way than might be expected, up the famous and fertile Arkansas River valley, never very far away from, and generally right along the Santa Fe railroad. There are two lines, one cutting across from Hutchinson to Kinsley, Kansas, and the other following the Santa Fe main line in a northwesterly way, around the great bend of the Arkansas, meeting the other at Kinsley and thence running along with the railroad to the Kansas-Colorado state line.

There the state of Colorado picks up the highway and carries it, still up the Arkansas valley, still along the Santa Fe railroad, to Pueblo and Canon City, from where it is planned to take it on to Colorado Springs and Denver.

The laws of the state of Kansas, because of the constitution, do not permit the state to engage in works of internal improvement. Hence it is not the easiest thing in the world to build a great highway like this, which lends still more interest. The work must be done in three ways: By utilizing the township road levies, which run from \$100 to \$500 per township; by aid from the county commissioners, which is generally in the form of bridges, etc., unless there is a county road, in which case the commissioners can spend considerable money; and by private subscription. All three methods are being used. In Colorado, of course, where there is no constitutional inhibition, the state highway commission and the counties can spend large sums of money.

A Continuous Great Highway.

The Kansas roads—the western Kansas roads—are principally common dirt roads, and not hard to build. So

the township boards will follow the lines laid down by the county engineers, and unite, county to county, end to end, a continuous east-and-west road, thus forming the great highway. If there are jogs in the road; if there are turns for a half mile or so, there is a straightening-out process put into effect, a new road laid out, or something else done to make the road as continuous as possible.

New bridges and culverts, mainly of concrete, the modern construction, are put in where needed. Roads are graded, using the ordinary scrapers, the big road-graders, cuts and fills made, and the King drag put on—the King drag is the standard split-log drag—until gradually a "crown" is put on the road and it sheds rather than retains water. Then the road is kept in constant repair.

At frequent intervals, very sandy patches are encountered. Here a search is made for clay, gypsum, or gumbo, and that is mixed with the sand, filling the voids, and making a "binder." Such roads become firm and smooth as pavements, like rock or macadam, and impervious to water. Much of this sandhills road work has been done in western Kansas, notably at Garden City, the most progressive of the smaller cities along the Trail. Seven miles of almost impenetrable sand was "bound" with a gypsum-clay mixture, and now forms what State Engineer Gearhart calls "the best road in the state of Kansas." There are a dozen of these in western Kansas.

Entering Colorado, crushed rock and tailings are used, making a fine thoroughfare. There are miles and miles of such roads in eastern Colorado.

The history of the New Santa Fe Trail is interesting. The idea originated in the mind of C. H. Scott, good roads editor of the Hutchinson, Kansas, News. Happening in Garden City, Kansas, one day a year ago, he mentioned it to R. H. Faxon, editor of The Garden City Evening Telegram, who had promoted the famous Garden City sandhills road the year before. The two put their heads together, and decided on a campaign for the Arkansas Valley Speedway, as it was first called.

The Work of Two Men.

For more than six months, these two conducted the best campaign of road publicity that the West has seen, gradually enlisting the support of every newspaper from Hutchinson, Kansas, to Pueblo, Colorado. It culminated in a great conference held early in the year at Hutchinson, when more than 300 delegates, including representatives of commercial organizations, farmers' institutes, board of



An Apple Orchard near Pueblo.

county commissioners, mayors, motor clubs, newspapers, and public-spirited citizens generally, met in convention and definitely laid the plans for the New Santa Fe Trail, as it was decided to call it.

The resolutions of that conference form probably what is the best document on good roads extant. Mr. Faxon was president of the conference and Mr. Scott was secretary. The organization was made permanent. With a vice-president in eastern Kansas and one in Colorado, and with an executive and publicity committee, with Faxon

(Continued on page 475.)

THE KINGDOM'S PRINCIPALITIES.

Colorado, Like Rome, Has Three Great Parts—and One Other in Addition.

FAMOUS as it is, and being the principality of which Pueblo is the capitol, the Arkansas valley is not the only section of the state of Colorado entitled to notice.

Besides this valley, there are three other districts well and favorably known in the West today. These are:

The San Luis valley section.

The Western Slope.

The North Colorado district.

The San Luis valley is a wonderful country lying to the southwest of Pueblo and tributary to it. It comprises about 3 million acres of irrigable territory, and close to a million acres already under water. It includes the four great Colorado counties of Costilla, Conejos, Rio Grande, and Saguache. Through its heart flows the great Rio Grande river, with the famous Rio Grande canal, one of the stupendous irrigation ditches of the West.

This great canal, with headgates near Del Norte, was built in 1884 at a cost of \$250,000. It is the property of the Rio Grande Land & Canal Company. It has 120,000

them, it is predicted. The Slope country is well adapted to raising beets.

Intensive cultivation naturally results in a fruit country, and the Western Slope is familiar with the value. Agricultural lands, especially in the fruit sections, sell for very high prices. There have been sales which ran as high as \$4,000 to the acre.

There are a half dozen very rich counties on the Western Slope, and development work is going on apace.

While the Western Slope has no centralized commercial organization, it has the Western Slope Development congress, which meets annually, and lends cohesive force to this great district of the state.

The famous Gunnison tunnel, so-called popularly, the official name of which is the Uncompahgre project of the government, is on the Slope. It is the most stupendous of all the government reclamation projects, from the engineering standpoint.

Grand Junction, Delta, Montrose, Paonia, Hotchkiss, and Gunnison are some of the leading fine towns of the Western Slope.

The North Colorado district is the cradle of irrigation in this part of the West. The Greeley district, founded by Horace Greely more than 40 years ago, is the birthplace of the irrigation efforts in Colorado.



70-acre Cherry Orchard on the Fountain Valley Land & Irrigation Company's Project.

acres under it, is 60 feet wide, and can carry six feet of water. When the National Irrigation congress officials visited its headgates early in June, it was carrying 1,400 second-feet of water, and was running four feet deep.

The San Luis valley is as level as a floor. The character of its soil is splendid. The principal products are wheat and peas. These latter are fed to the famous San Luis valley hog, which tops the market and adds wealth to this section of Colorado.

A beet sugar mill will be built at Monte Vista before the year is over, and enterprising men are already figuring on the beet possibilities of the valley. The work on the Monte Vista mill is in charge of W. D. Hoover and Ward Daryl.

There has recently been organized in the San Luis valley the San Luis Valley Commercial association, very closely patterned after the model merger in the Arkansas valley, and preparing to take an active part in the forthcoming Eighteenth National Irrigation congress and National Irrigation exposition.

The Western Slope is a famous district, too. Its principal forte is apples. The state of Colorado in the year 1909 raised more than 7 million dollars' worth of apples, and most of these came from the Western Slope.

There are also sugar mills on the Western Slope, and within the next year or so there will be several more of

The South Platte river waters most of the North Colorado district, and irrigation has reached such a perfect type of development as to permit of the utmost economy in the use of water—something not all the districts have yet learned.

There are a half dozen sugar mills in the North Colorado district, and the first essay at beets was in this district.

The Colorado state agricultural college, doing magnificent work, is at Fort Collins, in this district.

D. A. Camfield, the Titan of irrigation in the West, lives and has his field of effort at Greeley. That is also the famous potato district.

Hence Colorado has four great principalities that make up the kingdom.

WANTED—Position to take charge of advertising for an established colonization concern who is marketing irrigated lands. I have had extensive experience in handling work of this character for a concern that sold \$1,000,000 worth of land during the past two years. Am capable of writing articles for newspapers or preparing matter for display advertising. Can furnish excellent references. Address, A. D. M., care Irrigation Age, 112 Dearborn Street, Chicago, Ill.

Irrigation of Alfalfa

By SAMUEL FORTIER,

Chief of Irrigation Investigations, Office of Experiment Stations,
U. S. Department of Agriculture.

Amount of Water Required.

Alfalfa requires more water than most crops. This is readily accounted for by the character of the plant, the rapidity with which it grows, the number of crops produced in one season, and the heavy tonnage obtained.

As a result of careless practice there is a lack of uniformity in the quantity of water used, the volumes applied frequently being far in excess of the needs of the crop. The majority of the records collected and published by this office show a yearly duty of water for alfalfa ranging from 2.5 to 4.5 feet in depth over the surface, while in quite a large number of cases the volumes applied would have covered the area irrigated to depths of 6 to 15 feet.

From the large number of measurements made on the duty of water it is possible to select some that possess great value, since they indicate what can be accomplished with a given quantity of water.

During the season of 1904 careful measurements were made by C. E. Tait, of this office, of the amount of water used on alfalfa fields in the vicinity of Pomona, Cal. The rainfall at Pomona for the winter of 1903-4 was much below the normal and amounted to about 9.1 inches.* The quantity of irrigation water applied by pumping averaged 2.3 feet in depth and the yield of cured hay averaged from 1 to 1.5 tons per acre per crop, five or six crops being common. These figures are corroborated by many others collected in southern California. Perhaps in no other locality of the arid region is a greater tonnage of alfalfa obtained, yet in a climate of scanty rainfall having a long, dry, hot summer only a comparatively small amount of water is used. About a third of the 9,000 acres irrigated by the Riverside Water Company is in alfalfa and for the past seven years the average depth applied has been 2.31 feet, while the depth of rainfall and irrigation water combined has averaged 3.18 feet.

In 1903 the writer, when director of the Montana Experiment Station, applied different depths of water to seven plats of alfalfa with the results given in the following table. It will be seen that a high tonnage for so short a season as prevails in Montana was obtained from plat 5 with the use of 2 feet of water. By irrigating plat 6 seven times, and plat 7 eight times, it was possible to increase the yield to the amounts stated. The results of this experiment seem to confirm the best practice of southern California, which may be summed up by stating that in localities having an annual rainfall of about 12 inches remarkably heavy yields of alfalfa may be obtained from the use of 24 to 30 inches of irrigation water, providing it is properly applied.

Quantities of Water Applied to Alfalfa and Yields Secured, Montana Experimental Station.

Plat number.	Depth of irrigation.	Depth of rainfall.	Total depth.	Yield per acre of cured alfalfa.
	Feet.	Feet.	Feet.	Tons.
1	0.5	0.70	1.20	4.61
2	None	.70	.70	1.95
3	1.0	.70	1.70	4.42
4	1.5	.70	2.20	3.75
5	2.0	.70	2.70	6.35
6	2.5	.70	3.20	7.20
7	3.0	.70	3.70	7.68

The Proper Time to Irrigate Alfalfa.

The general appearance, and more particularly the color of the plant, are the best guides, perhaps, as to when water is needed. When healthy and vigorous, alfalfa is of a light-green color; but when the supply of moisture is insufficient the leaves take on a darker and duller shade of green and begin to droop, and unless water is provided both stems and leaves wither and die. Another test is to remove a handful of soil 6 inches or so beneath the surface and compress it in the hand. If it retains its ball-like shape after the pressure has been removed and shows the imprints of the fingers, the soil is sufficiently moist, but

if it falls apart readily it is too dry. In connection with such tests it is well to bear in mind that they are more or less influenced by both soil and climate. It is therefore necessary to observe the growth of the plant closely on all new alfalfa fields to determine if possible how far such tests may be relied upon, the chief object being to maintain at all times as nearly as practicable the proper amount of moisture in the soil surrounding the roots of the plants to prevent a checking of their growth.

Alfalfa commonly receives careless treatment at the hands of western irrigators. When water is available and is not needed for other crops it is usually turned on the alfalfa fields or meadows whether these need it or not. There is no question that yields of alfalfa might be considerably increased if more care was used in finding out when to apply water. In each kind of soil and under any given set of climatic conditions there is a certain percentage of soil moisture which will give the best results. Under the present unskilled practice it is impossible to maintain uniform soil-moisture conditions for any length of time. The soil is apt to receive too much or too little water, or else it is deluged with cold water at a time when it needs only heat and air. The number of irrigations required depends upon the depth and nature of the soil, the depth to ground water, the number of cuttings, and the rainfall, temperature, and wind movement. Other things being equal, more frequent waterings are required in the warm sections of the South than in the cooler portions of the North. The number of irrigations per year for alfalfa ranges from 4 in Montana and Wyoming to as many as 12 in parts of California and Arizona. In localities where water is scarce during part of the season the number of waterings as well as the amount used each time depends on the available supply. It is a common practice to apply frequent and heavy irrigations in spring when water is abundant and to water less often and more sparingly when the supply is low.

Winter Irrigation of Alfalfa.

When water is applied either to bare soil or to crops outside of the regular irrigation season it is termed winter irrigation. The practice thus far has been confined largely to the warmer parts of the arid region. It has become well established in Arizona and California and is being quite rapidly extended to parts of Oregon, Kansas, and the Rocky mountain states.

Experience has shown that a deep retentive soil is capable of storing a large quantity of water. On account of the fluctuation of western streams of all kinds, from the small creek to the large river, the greatest flow of water often comes at a season when there is least demand for it. In a few localities adequate storage facilities have been provided to retain the surplus, but as a rule it is allowed to go to waste. The passage of so much waste water led to the introduction of winter irrigation and in nearly every case the results have been satisfactory. The chief differences between winter and ordinary irrigations are the larger volumes used, the crude manner of conveying and applying the water, and the dormant or partially dormant condition of the plants at the time of irrigation.

In Fresno county, Cal., water is turned into the canals in January and February. The large canals of the Modesto and Turlock districts run more than half a head during the latter half of February. This is the rainy period in both these localities and the soil is usually too wet for plant growth, but water is applied to alfalfa fields to fill up the subsoil so as to provide a surplus for the rainless summer when water is scarce.

Besides furnishing a supply of much-needed moisture, winter irrigation, when conditions are favorable, prevents winterkilling and improves the mechanical condition of the soil.

Winter Killing of Alfalfa.

The winter killing of alfalfa is confined chiefly to the colder and more elevated portions of the Rocky mountain region and to the northern belt of humid states. Damage from cold is rare in Arizona and in California it is confined to young plants. In both the Sacramento and San Joaquin valleys of the latter state the seed is frequently sown in midwinter and the slight frosts which occur occasionally in December and January in both these valleys are severe enough to kill very young plants. The belief

*U. S. Dept Agr., Weather Bureau, Climate and Crop Service, California, Ann. Sums., 1903 and 1904. 373.

is common that the plants are safe after they have put forth their third leaf.

In the colder portions of Montana, Wyoming, Colorado, Utah, and the Dakotas alfalfa is apparently winter-killed from a variety of causes and sometimes from a combination of causes. The percentage of loss around Greeley, Colo., has been placed at 2 per cent per annum. In this locality and throughout the Cache la Poudre valley in northern Colorado most of the winter killing is done in open, dry winters and is quite generally attributed to a scarcity of moisture in the soil. In the winter of 1907 considerable damage was done to the alfalfa fields around Loveland, Colo., on account of the long dry spell in mid-winter. The old alfalfa fields suffered most. It was the opinion of the farmers that a late fall irrigation would have prevented the loss.

Near Wheatland, Wyo., the higher portions of the fields suffer most damage in winter, and here also the cause is said to be lack of moisture in the soil, combined with the effects produced by cold and wind.

At Choteau, in northern Montana, a farmer watered,

killing may be summed up as follows: Where both the soil and the air are dry the plant should be supplied with sufficient water for evaporation, but the land should be drained so thoroughly that none of the top soil is saturated; a late growth should not be forced by heavy irrigations late in the growing season; if the soil is dry, irrigate after the plants have stopped growing; and the latest growth should be permitted to remain on the ground, un-pastured, as a protection.

It may be stated in conclusion that the loss to the farmer from the winter killing of alfalfa is not as great as might appear at first. The damage is done in winter, and there is ample time to plow the plants under and secure another crop, which is usually heavy, owing to the amount of fertilizers added by the roots of alfalfa. The Montana farmer who increased his average yield of oats from 50 to 103 bushels per acre by plowing under winter killed alfalfa illustrated this point.

Seeding Alfalfa on Land to be Irrigated.

In Utah the most common practice now is to sow alfalfa without a nurse crop. From 12 to 18 pounds of



The pumping plant shown above, located on the ranch of Sam J. McAfee, Ault, Colo., has been doing duty for four years. The gasoline engine and centrifugal pump were sold and installed by Dempster Mill Mfg. Co., Beatrice, Neb.

late in the fall, part of an alfalfa field which was two years old, and it winter killed, while the unwatered portion escaped injury. This and other evidence along the same line which might be given go far to demonstrate that under some conditions too much moisture is as detrimental as too little.

Probably the chief cause of the winter killing of alfalfa is alternate freezing and thawing. The damage from this cause is greatly increased when any water is left standing on the surface. A blanket of snow is a protection, but when a thin sheet of ice forms over portions of a field the result is usually fatal to plants. The bad effects of alternate freezing and thawing on alfalfa may be observed at the edge of a snow bank. This crop is likewise injured by the rupture of the tap roots by the heaving of the soil.

From present knowledge of the subject, the means which may be used to protect alfalfa fields from winter-

Utah-grown seed is put in with a 6-inch press drill to a depth of $\frac{3}{4}$ to $1\frac{1}{2}$ inches during the first half of April. Irrigation before seeding is not necessary, as the soil is usually moist and contains sufficient moisture to support the plants until they attain a height of 6 to 10 inches. At this stage the alfalfa and the weeds are cut about 4 inches above the surface, the cutter bar of the mower being raised for that purpose, and the cuttings are left on the ground. Water is kept off after cutting until the crop begins to suffer. It is believed that when young plants lack moisture they will strike their taproots deeper into the soil in quest of water, and in this way develop a better root system than they would under frequent and copious irrigations. When alfalfa is sown with a nurse crop, oats is preferred. From 10 to 15 pounds of alfalfa seed is sown with 3 pecks to 1 bushel of oats.

(Concluded in August Number.)

From Barren Plains to Thrift

Thousands of Acres of Land of the French Irrigation and Land Co., in Antelope Valley, New Mexico, Redeemed to Homes and Plenty.

ONE can scarcely realize, as he looks over the immense reservoirs and ditches of the French Land and Irrigation Company, that but a little more than two years ago this valley was only a grazing ground for thousands of cattle and that no thought was given to the possibilities that now await those who have had the foresight to secure a tract of this land under the splendid irrigation system now being constructed.

valley all their ripe experience acquired by generations of tillers of the soil in the older settled states of the East. They fully realize the immense possibilities of the future and have gone to work with an energy and well defined system that will not admit of failure.

Guided by the wonderful results that have been obtained by the scattering rancher along the Cimarron and Verenejo rivers, they are planning big things that in a very few years will make this valley the equal of any of the famous valleys of the West.

Like all busy communities there is a diversity of ideas. Some are planning the culture of sugar beets, others the growing of alfalfa, others see in the development of the apple orchards the one great money maker and home builder of the future. None are without the elements of success and all will prove a winner to the farmer who combines good business judgment with the energy and perseverance necessary in every undertaking.

All of the products as well as the small grains and



Exhibit of the French Land & Irrigation Company at the Land Show in Chicago.

As one looks over the valley now he can see over 10,000 acres of waving grain and over 100 homes of settlers who have moved there within the last eighteen months and all of whom are enthusiastic over their future prospects.

Good, comfortable houses and outbuildings are rapidly nearing completion, young orchards are being planted in every direction, great steam plows turning over the raw sod, and it is indeed a revelation to a stranger who has come here expecting to see the usual dreary and desolate outlook common to what the Easterner terms the "sage-brush country."

The French Land and Irrigation Company has sold over 20,000 acres of its land to the best farmers of the Middle West and these men have brought to the Antelope

vegetables common to the Middle West have been successfully grown here for a number of years by the early settlers in the valley, so that the purchaser of the lands of this company have not only the hope of success but the absolute assurance that his honest labor will receive its reward.

The Antelope valley differs from many irrigated districts in this: Nearly all irrigation projects are narrow strips of land lying along the rivers, varying in width from one to three miles. The lands of this company cover an area nearly twenty miles square, which, when its irrigation system now under contemplation is finished, will make one of the largest bodies of irrigated land in the United States.

(Continued on page 477.)

RANCHO del PUERTO

By John Brent

(The following is a very graphic description of one of the most modern and model irrigation systems in the West, if not in the world. The article is written by the engineer, as the reader will note, and therefore is authentic and technically correct. It will be interesting to those studying irrigation, to follow the treatise carefully. The accompanying illustrations were taken with the idea of thoroughly illustrating the points in question, concerning the ranch and the irrigation system.)

"The Rancho del Puerto, situated on the west side of the great valley of the San Joaquin river, has long been known as one of the most fertile spots in that great state of fertile spots—California. Comprising about 18,000

The elevation of the land along the railroad is approximately 70 feet. At the banks of the river it is 18 to 20 feet, giving an easy slope towards the river of about 17 feet to the mile.

"A spot was selected about the middle of the ranch where the river had a straight course and high, firm banks, and a well was sunk about sixty feet back from the river and to a depth of 8 feet below low water. This was connected to the river by concrete tunnels provided with proper sluice gates.

"The area that could be irrigated under the proposed system was approximately 14,000 acres, and a duty of one second-foot to 160 acres was adopted. Investigations were made on both steam and electric power installations and the latter was found preferable, and the size of the pumping plant was increased to do the work in nineteen hours per day, thus being able to avoid the "peak load" of the power company. This gave a necessary pumping



Typical Ranch Home Near Patterson Colony, California.

acres, it was acquired by the original owner in the early sixties, and has yielded enormous crops of wheat and barley. Thousands of acres will yield thirty bags per acre (about 3,300 pounds) for the 1910 crop.

"The increasing demand for irrigated lands, and its advantageous situation for such purposes, caused the Patterson Ranch Company, of Fresno, Cal., through its president, T. W. Patterson, to install an irrigating system and put the land on the market in small tracts suited to the needs of purchasers. Mr. A. L. Adams, of San Fran-

capacity of 111 second-feet, or 50,000 gallons per minute.

"A careful contour survey of the land was made and the areas that could be irrigated from laterals at different levels calculated. It was decided to install five pumping stations connected by concrete-lined canals, these stations being so located and provided with such relative amount of pumping capacity, that when in full operation there would be sufficient difference between them to allow of irrigating the zone of land between the respective levels supplied by them. The pumping unit worked out to a 15-inch



View of Main Canal 24 Feet Wide at Top, Patterson Ranch, California.

cisco, was called into consultation, and plans for the work were made under his direction, Mr. G. C. Stevens being engineer in charge of construction.

"The ranch lies between the San Joaquin river on the east and the Southern Pacific Railway on the west, having a length of about nine miles, and a width of three miles.

centrifugal pump, delivering approximately 6,000 gallons per minute, or 14.3 second-feet. In the lower stations, two of these were replaced by one 20-inch pump delivering 12,500 gallons per minute, or 27.7 second-feet.

"As near as could be ascertained, the normal rise of the San Joaquin river at the point of taking water, is about

15 feet, and the average height of the stream during the time that water would be pumped for irrigation, is 5 feet. Calculations, therefore, were made on this basis, and the speed of the pumps determined in accordance, giving an average lift of about 20 feet at the river station. At the other stations the regularity of the land gave a lift of about 13 feet in all cases.

"The problem of conveying the water from one station to the next and of distributing to the laterals was

to the reservoir. The boards are usually kept in the waste ditch, and so would divert any water running over a spillway into the next regular reservoir below, thus losing only one lift. If, however, it was desired to pump down a reservoir, the boards being placed in the entrance would pass the water down the line to the river and finally reach it.

"At each station there is a provision made through a "tee" in the delivery pipes, by which any reservoir can



Showing Canal Emptying into Reservoir, Patterson Ranch, California.

given careful study, and, after a comparison of pipes, flumes and gutches, it was decided to adopt the latter; these being designed with a uniform slope of .0002 and lined with 3 inches of concrete and protected with one-quarter inch of plaster finish.

"The slope of the ground was such that the maximum height of embankment was about 8 feet. The distributing laterals were taken off at a point where the flow line in the canal was 18 inches above the ground level. The canal was then continued into cut, and ended in a reservoir calculated to have approximately one hour's supply for the pumps drawing from it. These reservoirs were lined with 5 inches of concrete, with $\frac{1}{4}$ -inch plaster finish. In

be pumped down, or water allowed to escape from the canal ahead, and pass into the waste ditch.

"The discharge of the water from the pumps into the canals has been carefully designed, the arrangement and dimensions of the passages being such as to give a uniform decrease in the velocity from that of the pump to that of the canal. The end of each canal, where it discharges into the reservoir, is widened and provided with a weir. Below the weir is a basin that acts as a water cushion. With the proper electrical instruments, the plant can be kept under constant test conditions.

"The distributing laterals (ten in number, one for each side of each canal level) are provided with a specially



Showing Transforming Station of Power Line, Which Furnishes Electric Power for Patterson Irrigation System, Situated at Reservoir No. 1.

the canals and reservoirs an asphalt expansion joint was put every 12 feet.

"In each of the canals an emergency spillway was built, consisting of a weir with its crest 12 inches above the normal flow line of the canal. These spillways discharge into a waste ditch running parallel to the main canal. At each reservoir there is an opening from the waste ditch to the reservoir so arranged that flash boards can be placed either in the waste ditch or in the entrance

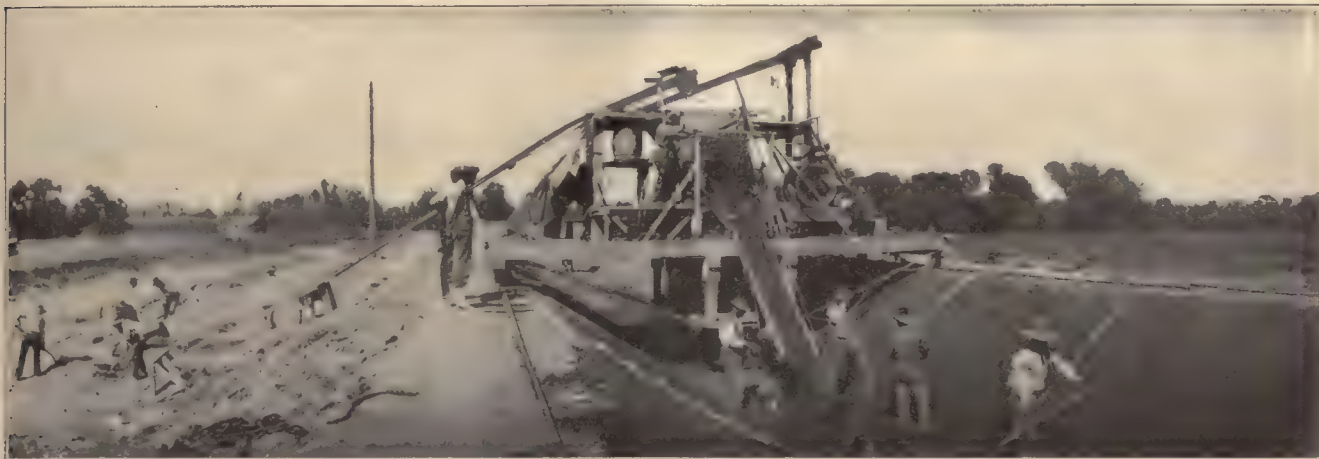
designed regulating and measuring device. It consists of a 24-inch balanced valve used in connection with a discharging weir. On account of the necessity of conserving head, this weir was made 16 feet in length and set diagonally across the lateral. The cases of the balanced valves are made of concrete, with the valve seats and other metal parts cast in. A tube with an opening that can be adjusted to any height above the weir connects with a scale pan that controls the position of the valve discs

in relation to their openings. Any flow of water through the tube and into the pan tends to close the valve and restrict the flow of water. A small hole in the bottom of the pan allows this water to escape and a weight and spring opens the valve again, thus keeping the flow over the weir at a constant height.

"The pumps were built to specifications. They are all of the double-suction type, having the cases split horizontally, both suction and discharge connections being in the lower half of the case, allowing the removal of upper

one to stations Nos. 3, 4 and 5, and to the town of Patterson across the railroad. The circuits were designed to have a loss of 5 per cent at maximum load. Each motor has its own controlling panel with switch, starting compensator, ammeter and overload release. Each station further is provided with low voltage release. At the main transformer station are provided wattmeters and recording voltmeters."

This large ranch, consisting of approximately 18,000 acres, lies in the heart of "Sunny Stanislaus," between the



Digging Main Canal, Patterson Ranch, California.

half of case, the runner and shaft, without disturbing pipe connections. The 15-inch pumps are provided with a 24-inch suction and 20-inch discharge, this 20-inch discharge increasing to 24 inches within 4 feet after leaving the pump. Each pump has a separate suction provided with a foot valve having a clear area of 140 per cent of the connecting pipe. The 20-inch pumps have 30-inch suction and 24-inch discharge valves, increasing to 30-inch as above. In the normal running of the plant, the water in the canal ahead would serve to prime the pumps; but to obviate any difficulty which might arise if the canal were empty, an air compressor, driven by an individual motor, has been installed in each station with a system of piping connected to the pumps. These compressors used as air pumps soon

San Joaquin river and the Southern Pacific Railroad, 108 miles southeast of San Francisco. The San Joaquin Valley is one of the richest in the state; Stanislaus is one of the richest counties in the valley; the Patterson ranch is the best ranch in Stanislaus county, and probably in the state of California.

The soil, which is of an enormous depth and of alluvial sedimentary deposit in character, is exceedingly fertile. It is of a grayish brown color, easily pulverized and irrigated and responds readily to the good care of the husbandman. Almost any product of California can be successfully grown here.

The San Joaquin river is navigable from the ranch to San Francisco, and to Sacramento, the state capital. The



San Joaquin River at Point Where Water Is Pumped for Patterson Irrigation System.

discharge the main pump. Each pump is driven by an inductive motor of proper size by means of a silent chain.

"The motors are wound for 2,300-volt, 60-cycle alternating current, and the power is supplied from a public transmission line which brings the current 39 miles from the main power line—at 60,000 volts—transforming it to the lower tension near station No. 2 of the irrigating system. From this point three 2,300-volt circuits are taken off, one to the river, or station No. 1; one to station No. 2, and

many thousand bushels of grain that have been raised in years past on this mammoth ranch have largely been transported to the markets of the world on boats loaded at the east side of this ranch. This fact and feature insures cheap transportation. The San Joaquin river bounds the tract on the east, and the San Francisco-Los Angeles line of the Southern Pacific Company runs along the west side of the ranch for its entire length, the ranch being

(Continued on page 476.)

THE MAN BEHIND THE PLOW

VS.

THE SCIENTIFIC FADDIST

By A. F. JOHNSTON

TO THE man behind the plow, who is blest with good judgment and common sense, should credit be given in a large measure to successful farming the world over, and to him, therefore, should the public look for advice and instruction far more than it does. Perhaps in no section of the United States is this more applicable than in the arid states of the west where other problems than those of tillage and selection of crops enter as a factor into the farm management. Would it were better understood and the methods of the practical successful farmer adopted more generally. It is to this end that I wish to present a few facts that have come to my notice within recent years.

management, a knowledge that many a farmer would value, together with the practical training from the farmer himself our agricultural students have a large field of usefulness in the development of agriculture, but they must work in harmonious co-operation with the practical farmer or their efforts will count for little or nothing, and every such a failure is a stumbling block for other students. It is not without a knowledge of conditions that the writer feels the necessity of defending the farmer and urging the college and department man to deal by him as they would be dealt by. If they are wise they will profit by their intercourse with the man behind the plow, and if they are just they will give him credit for having helped them.

Must Have Practical Experience.

In the western colleges and universities irrigation instruction is supplementing the agricultural course, and the profession of irrigation engineer has been added to the list of vocations. It is a course that appeals to the western boy and already the majority of the institutions, with this course included, find it a popular one. Instruction along the line of irrigation engineering is very essen-



Cement Reservoir No. 2, Patterson Ranch, California.

Much has been said and written for a number of years regarding scientific farming, and almost all the agricultural colleges have made this feature a part of their course of instruction, some of them having systems highly perfected. The United States Department of Agriculture has also taken it up through its bulletins and its trained men in the field to instruct the farmers.

Now, while we, who have studied the subject from the farm and the classroom, contend that agricultural education is a good thing and to be highly commended if rightly applied, we also feel quite confident in saying that it can never successfully accomplish its object until the college man or department agent takes a course of instruction from the man behind the plow.

In many cases the know-it-all student or agent does more harm than good because his judgment and common sense in farming affairs has never been given proper training. Many times he offends the man whose years of rich experience should be considered and information is refused by the farmer because of this attitude, and it naturally follows that he discredits the institution he represents.

With the knowledge of how to apply science to farm

tial and we believe it means a broader and richer development of western lands in the future. But here again, perhaps even to a greater extent, is the need of practical experience only to be acquired from the farmer who has conquered this phase of agriculture by his good judgment and common sense.

Unless the student realizes this and augments his college education with such training he will not go far. The knowledge of how to irrigate can never be conquered on paper, nor can it be successfully rounded out by the summer field parties, instructive and valuable as they are. It is to the man behind the plow that the student must go for his best object lessons. To illustrate this I wish to cite examples of successful and unsuccessful men in their relations to the practical farmer. One example relates to personal contact with the farmers while the second has reference to articles published for the benefit of the man behind the plow.

Two graduate students in agriculture were appointed to collect information on different crops in certain western states. For convenience, let us call them A and B. A was to collect information on potatoes, B on alfalfa, and the outlines they had to fill in, or complete, meant a care-

ful and thorough investigation from the turning of the sod to the sale of the products. Let us follow *A* first. He collected all his forms, those needed in the work and many not needed, including his commission and his certificate of graduation. These latter were to impress and humble the farmer with the high position to which he had become eligible by his superior fitness, and were carefully placed in a legal envelope and carried in his handy pocket.

Arriving in the territory he was to canvass *A* called upon Farmer Jones and introduced himself something as follows: "I am a graduate of the ——— Agricultural College. I graduated with honors and know all there is to know on the subject of agriculture, and because of my general fitness I have been selected to assist in preparing a report on potato culture. Now we wish to include in this report the methods of the ordinary farmer so that we can point out to him his errors and thus help him to improve his humble condition. I, therefore, request you to describe your method of raising potatoes, giving all details."

With pencil in hand and note book open, *A* is ready

He concluded that the farmer must have had an unpleasant experience with some of the other boys and that he (*B*) would have to overcome that impression in the valley before he could proceed with his work. He was blest with a fair amount of common sense and tact and had Jones listened to him he would not have classed his second caller with the one of a month before.

On his arrival at the Brown ranch he tactfully waived the personal introduction and casually asked if he might water his horse. Permission was granted and while waiting for the horse to drink and rest he made the acquaintance of the farmer's eight-year-old daughter and two-year-old dog, and by his diplomacy finally won the farmer's attention. First the weather was discussed, then high prices in living, good prices for crops, and finally the subject of farm management was reached. Brown was at home on this topic and *B* was a good listener.

No Theory, Only Facts.

The conversation, with an illustrative tramp around a portion of the farm, continued until noon, and by that time



Cement Construction Work on Main Canal, Patterson Ranch, California.

for business. How much information do you suppose he obtained from Jones? We will make it brief by saying that he departed with his note book as blank as when he arrived. His next visit was to Farmer Brown and was a repetition of the Jones' interview, and then our student began to wonder why he, with his ability and newly acquired authority, should be so uncivilly treated.

It did not take Jones and Brown long to report "the little upstart" to the other valley settlers, and, as a result *A* left his first field of labor with no definite knowledge of how potatoes were raised in that section. He resented the attitude toward him, and in his report to his superior officer he stated that he found the farmers, as a class, rude and unwilling to be interviewed.

Perhaps a month later *B* entered this same valley to canvass for data on alfalfa, and called on Farmer Jones, but he got no further in his introduction than "I am a graduate of the ——— Agricultural College" before Jones told him that was sufficient, that he knew all about him and his kind and advised him to move on before he loosened the dog. *B* took the hint and departed, but when he had gotten out of sight he stopped his horse by the road side and tried to solve the reception he had had.

B knew how the land had been prepared for the alfalfa, the cultivation it had been given, the number of irrigations and the amount of water applied during the season, number of cuttings with yield in tons for each cutting, and why the yield was greater at one cutting than at another, in fact all he wanted to know, and much he had never known before which he took note of carefully for his own reference as well as for his report.

His previous reading on alfalfa had been to the effect that it was a crop that could be as profitably grown without irrigation as with, owing to the long roots that fed on the subsoil moisture for nourishment. But when he left Brown it was with the following entry in his notebook, under "Remarks:" "Alfalfa requires irrigation and the water should be plentifully applied as the principal feeders or rootlets that nourish the plant are near the surface. The roots that penetrate deeply are not important feeders."

By his tact and good judgment *B* was successful in the valley, and when he left he felt he had taken a post graduate course in agriculture which would benefit him fully as much as his previous training in college, and it is a pleasing fact, well worth notice, that he impressed every

farmer in the valley, even to the converted Mr. Jones, that it was knowledge he was after and that they were truly assisting him by their discussions on farm management. His report to his superior officer was satisfactory and he was favorably mentioned for a continuance in the service because of his ability to meet men on pleasing terms, get the most information from them, and at the same time, he benefited and broadened himself. Such a man is valued in any walk in life.

in facts and lessons, written for the man who profited thereby.

This is not cited to belittle college education, far from it, but to prove that no education is helpful or worth while where technical or scientific terms hide or cloud the meaning of the text to the laymen whom the article is intended to benefit. The farmer has learned not to waste his time reading such articles, which doubtless contain much that would be instructive if not hidden by big words, but turns



Constructing Cement Reservoirs, Patterson Ranch, California.

Not long ago a certain agricultural paper published two articles on the subject of "Farming by Irrigation in the West." One was written by a college graduate and for style, good construction and perfect English, it was a masterpiece, and was doubtless highly praised by the college professor, but the puzzled farmer had a headache after he finished reading the article. His first impression was that he was a failure and that it was nothing more than a miracle that he had ever succeeded in raising anything on his farm, but the more he tried to intelligently comprehend the article the more he became convinced

his attention to the plain talk of one who understands his subject and also the needs of his brother on the farm.

When the college man can talk and write to the farmer in his vernacular and augment his knowledge with good common sense, then will the layman be benefited and the college will have fulfilled its mission in agricultural pursuits. Until then the farmer will undoubtedly receive his most valuable lessons from the farmer, and for the good he has done his fellow men and his country, the man behind the plow should be consulted and acknowl-



Construction Work on Cement Reservoirs, Patterson Ranch, California.

that, so far as he could interpret it, the methods were entirely impracticable for general farming, and that, on the whole, it was not worth trying to understand.

The second article was written by a practical farmer, a man who had had but three months schooling in all his life, but with thirty years' experience in irrigated agriculture. In his straightforward, simple way he explained his methods, using the terms that all farmers understand and appreciate. While faulty in construction, it was eloquent

edged as a prime factor in agriculture, the leading industry of our country.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, cloth bound, a 260-page finely illustrated work for new beginners in irrigation.

THE TOWN THAT DOES THINGS.

Garden City, Kansas, Where There Is Always "Something Doing" for Good.

GARDEN CITY: The Town That Does Things. "Always Something Doing in the Good Old Town."

These above two expressions have been applied time and again by one of the publicity factors in behalf of Garden City, Finney county, Kansas, to the capital of the lower Arkansas Valley.

Both expressions are pat and convincing. More than that, they are susceptible of ample proof and demonstration.

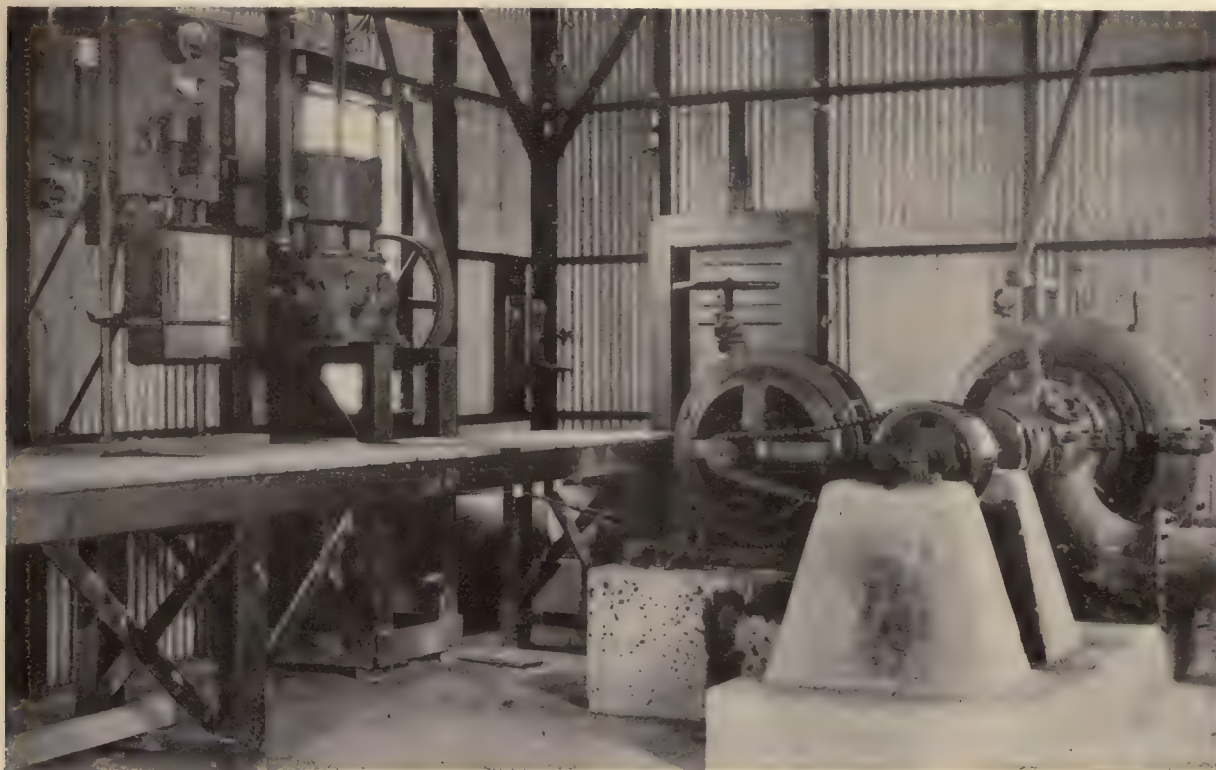
Garden City does things because it has town spirit. The happiest possession any town can have is assurance and confidence of ability to make good. Garden City possesses these qualities. It is seldom it undertakes a thing that it does not go straight to the end and accomplish the net result desired.

three years it has been making good on this. It is holding in July, 1910, its third successful chautauqua assembly. It has for two years successfully given a great entertainment in the fall known as the Cattlemen's Carnival, when sports and exhibitions of a most captivating nature have pleased thousands of people. It entertained in May, 1909, the grand lodge, Kansas Knights of Pythias. Get this, in that connection: A town of 4,000 people entertained 1,000 people. That's worth considering. Garden City entertains editorial conventions, teachers' associations, farmers' institutions, ministerial associations, state real estate agents, Santa Fe Trail conferences, and valley commercial associations.

Isn't that a record of which a town may properly be proud?

Garden City wasn't satisfied with the school building situation. Having two fine ward schools, as sightly and commodious as anywhere in western Kansas, it is now completing a handsome \$35,000 high school building.

Garden City wasn't satisfied with its lack of public



Interior Pumping Station No. 1, Patterson Ranch, California.

The Industrial Club of Garden City is the principal reason for this. Garden City's population is 4,000. The membership of the Industrial Club is 227. Do you get that? Does it soak in on you? A town of 4,000 population has a commercial body to which every able-bodied man of any affairs in the town whatsoever belongs, 227 in all. Besides, the membership fee in this organization is \$20, and the monthly dues, \$1. These facts speak for themselves. They need no elaboration. They form the acme of town spirit, the agency by means of which any town can make progress.

Garden City never adopted a slogan. Most of its citizens are not strong for the slogan. Some of them believe the slogan to be a pest and that it should be assassinated if it shows its head. Nevertheless, the pat phrase, "Always Something Doing in the Good Old Town," is not without especial significance.

Boosters and town builders understand thoroughly that there must be perpetual issues to keep a live town alive. Garden City and the Industrial Club know this. Hence the frequent use of the expression "Always something doing in the good old town," and the absolute fact that a half dozen things are always going on.

For instance, Garden City, a small town in western Kansas, aspires to be a public entertainer. So for two or

buildings, so it went after a government public building, to house not only its post office, but its six other governmental branches—reclamation, forestry, irrigation investigations, United States commissioner, live stock inspector, etc. Congress gave it \$60,000 for this purpose.

Garden City isn't satisfied without good churches, and various movements are now on.

A town hall and a court house, a Masonic temple and an Odd Fellows' building, are campaigns of the present.

Garden City wasn't satisfied with good streets, wide and fine, bordered with magnificent trees, with the emerald of closely clipped lawns and shrubbery and flowers in the background, so it was one of the very first towns in Kansas to apply the King drag regularly to the streets.

Garden City was the first small town in Kansas to authorize by act of council a park commission, and this agency has made the town famous.

Garden City needed new business blocks; it promptly built them.

Garden City wasn't satisfied with its railroad rates, and with the advent of two new railroads wanted more territory in which to trade. Therefore, Garden City went after the Atchinson, Topeka & Santa Fe railroad and got a jobbers' rate that permits it to stand alone in extreme western Kansas towns in this respect.

Garden City wasn't satisfied with good roads—it wanted better roads. So it built the seven miles of sand hills' road south of town, connecting a fertile agricultural valley and the inland town of Santa Fe with what Engineer Gearhart has called "the best road in Kansas." This was constructed under government supervision, from clay found all along the hills.

For precisely the same reason, Garden City was one of the two factors that gave origin to the movement that has led to the great New Santa Fe Trail movement.

Garden City is the seat of the field of endeavor of the United States Sugar & Land Company, that has invested in that district the sum of 5½ million dollars. This includes the magnificent beet sugar mill at Garden City, costing more than a million dollars, slicing 1,200 tons of beets daily, with a pay-roll of \$800 during campaign, and capable of making 375,000 pounds of sugar in one day. This company is now building at Garden City a pulp-drying plant costing \$200,000, and has a \$200,000 pumping plant to irrigate 5,000 acres.

U. S. Reclamation Record.

A digest of the latest developments in connection with the United States Reclamation Service, including "Public Notices" and "Service Orders" of public interest.

SERVICE ORDERS.

Convict Labor.—Hereafter the following stipulation should be inserted in all contracts executed upon forms 7-523 and 7-523a:

It is further stipulated and agreed that in the performance of this contract no persons shall be employed who are undergoing sentences of imprisonment at hard labor which have been imposed by courts of the several states and territories or municipalities having criminal jurisdiction.



Irrigating an Orchard Just Planted, Patterson Ranch, California

Garden City is the headquarters for the Kansas national forest, on which nearly a million young trees are now growing, and having an area of more than 250,000 acres south of the Arkansas river.

Garden City is the seat of the Garden City reclamation project of the government, with an acreage of 8,000.

Finney county last year raised 2½ million dollars' worth of agricultural and live stock products.

Garden City has in its territory five irrigation ditches, and the Garden City district has nearly 75,000 acres of irrigated land, with the splendid Shallow Water Empire immediately north, now being developed, with an equal acreage.

Garden City has two new railroads, one to the northwest, one to the north and south, opening up new fields for trade cultivation.

Garden City has a fire department, electric lights, a telephone system with 700 patrons, 50 street lights, a daily and two weekly newspapers, churches, fine schools, all the leading fraternal organizations, and a splendid type of citizenship.

What more could be desired?

Garden City: The Town That Does Things.

"Always Something Doing in the Good Old Town."

PUBLIC NOTICES.

Washington, Sunnyside Project.

On May 2, 1910, public notice was issued announcing that water will be furnished in the irrigation season of 1910 for the additional lands under the Sunnyside project, shown on the amended plat of T. 8 N., R. 23 E., W. M., approved by the Secretary of the Interior, April 15, 1910, and on file in the local land office at North Yakima, Wash.

Homestead entries, applications for water rights, the charges, time and manner of payments shall be governed by the terms of the public notice of November 18, 1908, and public notices and orders amendatory thereof, or supplementary thereto, except that for lands in private ownership and for lands heretofore entered, the first installment of the charges for building, operation and maintenance, shall become due on May 18, 1910, and in all cases the second installment shall be due March 1, 1911. Subsequent installments shall be due on March 1 of each year thereafter until fully paid.

A DAM TO LAST FOR AGES.

The Wonderful Structure Being Built on the Twin Falls Salmon Tract.

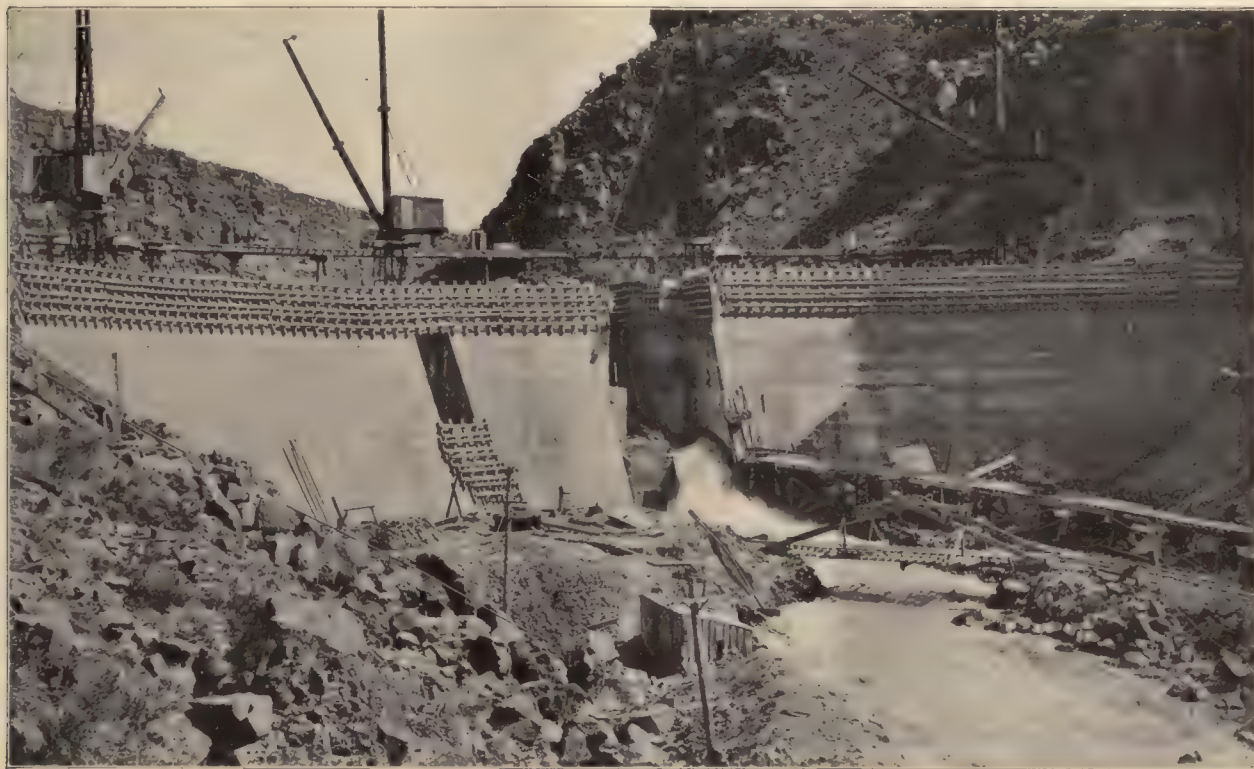
In a narrow canyon, far from any settlement in southern Idaho, an army of engineers, mechanics and laborers are building one of the greatest dams in the world. This mammoth structure will rank as one of the highest, costliest and most enduring structures of the kind in existence. This is known as the Salmon Dam, and its location is in the canyon of the Salmon Falls or Little Salmon River in Twin Falls county, some forty miles southwest of the city of Twin Falls.

The enterprise which necessitated this extensive structure is the irrigation of a tract embracing 125,000 acres in the same county south of Twin Falls. This is known as

the outlet of the second tunnel the water flows in a main canal along the southern boundary of the extensive tract to be irrigated.

This tract joins what is known as the Twin Falls South Side Tract, and is one of the four extensive tracts that are being irrigated in the Twin Falls country by the organization of J. S. & W. S. Kuhn of Pittsburg. Mr. H. L. Hollister of Chicago is the associate of Messrs. Kuhn in this extensive work, and it is through his office that the colonization of the Kuhn properties is being carried on.

The Salmon dam will be completed in time for irrigation in 1911. The principal town in the new tract is Hollister, some seventeen miles south of Twin Falls. Already a railroad has been built through the tract by the Oregon Short Line Company as a branch of the Minidoka & Southwestern. The town of Hollister has already become an important center because of the immense range and mineral country lying south of the Salmon tract. It



The Mammoth Salmon River Irrigation Dam, Twin Falls County, Idaho. A Close View of the dam when at a height of 80 feet looking south.

the Twin Falls Salmon tract, of which 80,000 acres were segregated under the Carey Act some three years ago.

The opening sale of these lands was held on June 1, 1908, and at that time, with the exception of a few farms here and there, the entire tract was sold out, so that even a 40-acre tract has not been available for more than a year. The eagerness with which this land was purchased illustrates the great demand for good, irrigated land under a well-built and enduring system of water supply.

The accompanying pictures show the Salmon Dam in course of construction. The dimensions are as follows: Height of dam at center, 220 feet; thickness of dam at base, 108 feet; length of dam at top, 500 feet; thickness of dam at top, 22 feet.

It will be noted that the dam is arched up stream and braced against the two walls of the canyon. The canyon widens into a broad valley a short distance above the dam and affords a storage basin of vast extent. The dam will contain available water storage approximating 260,000 acre feet, or enough water to cover more than eleven townships a foot deep.

For the purpose of delivering the water to the land it is drawn from a reservoir through tunnels in the east wall of the canyon, the first of these being 1,300 feet in length, and the second about 2,500 feet in length. From

is through Hollister also that the famous new mining camp of Jarbidge in the northern part of Nevada is reached.

The people of the Twin Falls region are looking forward to the time in the near future when they may truthfully say that a million acres are under irrigation in a solid body in southern Idaho. The development of the Twin Falls region has been observed with great interest by people all over the West, and the completion of the Salmon Dam will give a tremendous impetus to development in that part of the state.

Send \$2.50 for The Irrigation Age, one year,
and the Primer of Irrigation, a 260-page, cloth
bound, finely illustrated work for new beginners
in irrigation.

BIG MOUNTAIN

Pike's Peak's is Now Easily Accessible for a

Pike's Peak, that wonderful monument that marks a strange and long hidden history was discovered November 13th, 1806, when Major Zebulon M. Pike, a gallant soldier and daring adventurer, then heading a small exploring party of United States soldiers, sighted the mountain's whitened crest when many miles distant upon the plains. After a painful journey of ten days and after many vigorous attempts to scale its heights, Pike abandoned the project with the declaration that "no human being could ascend to its pinnacle."

At that time and to this bold adventurer used to extraordinary achievements and hardships, the feat seemed, indeed, impossible, but modern ingenuity of man quickly solved the problem and today the ascent from the beautiful little city of Manitou, at its base, to the very top of the mountain, is made in perfect comfort and safety within one and one-half hours.

For many years the ascent was made by visitors in coaches drawn by strings of hardy mules, a rough, jolting and uncomfortable journey, attended with some dangers. Now, the Cog Wheel Railroad, a marvel of mechanical ingenuity, bears on its smooth rails modern coaches from base to summit, and back again, making a pleasant half day's journey, with ample time for tourists to observe every marvelous scene of beauty and interest which this mountain affords.

Quaint beauties, grotesque shapes and strange illusions fairly crowd the way. The climb is unceasing. As the train ascends the scene expands. The hills shrink back and leave the big, bleak peak a towering monument. At the timber line the trees desert the landscape and only groups of stunted aspens shiver in the breeze. Grand vistas open everywhere and a sense of awe transcends that of delight.

There are six stations on the line besides the terminals, and at each of the stations the train makes brief stops. In the early season snow is everywhere, and forms some strange effects. The opening of the road in the spring involves cutting through enormous depths of snow and ice. The summit of Pike's Peak is 14,147 feet above the sea and



Summit Hotel

in this country, but there is no accessible elevation on earth that affords so an extended a range of vision, or a view so varied and inspiring as that from the summit of Pike's Peak.

The reason is simple. All other high mountains are in the midst of mountain chains and naturally the view from their summits are uninterruptedly mountainous and the ranges of vision very much restricted by the surrounding heights. Standing isolated at the very extremity of a grand spur of the Rocky Mountains, Pike's Peak possesses a magnificent view of miles upon miles.

A proper description of these wonderful scenes in cold type is so futile that it will not be attempted. The picture herewith will give some faint conception of its beauty and grandeur.

The top of the peak comprises several level acres thickly strewn with big rocks, and one might easily imagine it to be the scene of some Titanic building project—the materials all assembled but construction abandoned.

Upon the top of the new Summit Hotel is a steel tower and powerful field glasses are provided through which the gorgeous landscape spread out below may be studied in detail. Denver, eighty miles to the north can easily be recognized, and Pueblo to the south; Cripple Creek, Victor, Goldfield, and lesser towns of this great mining district, to the west. At the base of the mountain Manitou and Colorado Springs lie spread out like a vast checkerboard, sparkling in the sun on the border of the plain. Colorado Springs is fourteen miles distant in a perfectly straight line and yet so near does the glass bring it to the observer that signs on the stores may be read.

Few persons, comparatively, know the sensation of looking from a mountain top over thousands of miles of the earth's surface. The sensation affords an indelible recollection; one of the cherished experiences of a lifetime.

The Pike's Peak railroad presents to many thousands an



Summit of Pike's Peak.

from this vantage point the grandest scenery in America or in the world spreads out in a mighty panorama for the view of the beholder. There are higher peaks of mountains

EASY TO CLIMB

ca, by the Route of the Cog Wheel Railroad



COPYRIGHT 1908 BY V.C. WARD.

Peak.

opportunity to gain this experience, an opportunity which otherwise they would never enjoy, because without it only those physical aristocrats who have superior development in limbs and lungs would be permitted to stand "close to the sun in lonely lands." The Cog Wheel Road reduces all men to a level in their physical ability to enjoy this pleasure. Without exertion, without fatigue or discomfort in the slightest degree, anyone able to travel in a railway coach can be lifted up to the strange region of clouds and storms, and for a few hours exist in the heart of eternal desolation.

To the commonplace man this trip is like living a chapter from one of Jules Verne's romances. Whatever susceptibility to grand impressions, whatever poetic fancies the dullest mind may have, are sure to be aroused and exercised by this experience.

On the very summit of the peak is a substantial, commodious and comfortable hotel, which furnishes entertainment for thousands of pilgrims who during the season remain over night to view the glories of the sunrise. It is provided with telegraph wires and all the comforts and conveniences of the best modern hotels in the west. Sunrise excursions, which are run weekly in the latter part of the summer, have become very popular and frequently the entire equipment of the hotel is required to handle the enthusiastic throngs of visitors.

From the steel observatory surmounting the hotel, a searchlight of great power is operated. Its path of light may be seen from adjoining states and when its rays are projected along the highways and into the cities and villages of this region, it is a reminder that Pike's Peak, the sentinel of the Rockies, stands vigilant over its own.

Pike's Peak occupies a more prominent place in the story of the exploration and occupation of the great west than any other name. Pike's Peak was adopted as the unofficial designation of this section of the country

before the land west of the Missouri river was mapped and before the territories were bounded and named, and is stood as a guide to the thousands of eager pioneers when they were moving to the mysterious west.

The traveler who now makes the ascent of Pike's Peak in comfort by its wonderful railway cannot appreciate the amount of study devoted to the difficult problem by the best engineers and mechanics, or the perils and hardships attending the survey and construction of the road. Camping out, climbing over mountains covered with fallen timber and jagged rocks, the occasional intense cold, terrible snow storms, fearful winds and the difficulty of getting provisions, made this undertaking one of heroic proportions.

Work was commenced in 1884 and nearly eight miles were graded for a line which was intended to reach that point by a circuitous route thirty miles long, with a five per cent grade. The present road was conceived in 1888 and the golden spike driven October 20th, 1890. The railway overcomes an elevation of 7,518 feet. The train is lifted by a system of Abt rack rail, which forms a continuous double ladder into which the two wheels of the locomotive work. The road-bed, from 15 to 22 feet in width is cut from or built upon solid rock in most places. There is not a trestle on the line and only four short bridges, which are of iron resting upon solid masonry. The track is anchored by 146 anchors embedded into solid rock or masonry at distances of from 200 to 1,400 feet apart, according to the grade.

The rails are forty pounds to the yard, standard gauge. The rack rails are made from the best adapted Bessemer steel, the teeth having been cut from the solid piece by machines especially constructed for the purpose. The rack rails in the center are constructed of extremely heavy steel. This road is as safe for travelers as any village car line in the country.

A visit to Pike's Peak may include, without extra cost to the traveler, visits to scores of the most beautiful resorts in the country. Manitou and the Garden of the Gods are at its very feet. Seven Falls, historic Ute Pass, Rainbow Falls and scores of other minor, but beautiful resorts are all within a few miles' journey from this beautiful and notable starting point.

Six miles from Manitou on an unbroken plateau, lies the city of Colorado Springs, with a population of 40,000. Midway between Manitou and Colorado Springs is Colorado City, the first settlement in Colorado, where may be seen an ancient cabin in which the first territorial legislature assembled. Denver lies eighty miles to the north of Manitou a rich, beautiful and busy city of 200,000 people.



Climbing Pike's Peak Timber Line—25% Grade.

A trip from Denver to the summit of Pike's Peak and return can be made easily and comfortably in one day.

THE CAREY ACT

How to Acquire Title to Public Lands Under The Act.

A Comprehensive Survey of the Regulations in Force in the Various States.

Copyrighted, 1910, by E. F. Bohm.

(Concluded.)

FEDERAL REGULATIONS.

1. The states are allowed 10 years from the date of the approval of their application for segregation, to complete the reclamation of the lands. The Secretary of the Interior, may, at his discretion, extend this time for a further period of not to exceed five years.

2. The lands selected must be desert lands as defined by the acts of March 3, 1877, and March 3, 1891, and the

Department of the Interior to judge of the practicability of the plan.

Upon the filing of the map by the state, showing the lands selected and the plan of irrigation such lands will be withheld from other disposal until final action is had thereon by the Secretary of the Interior.

If such final action be a disapproval of the map and plan the lands selected, shall, without further order, be restored to the public domain. (See regulations under act of March 15, 1910, below.)

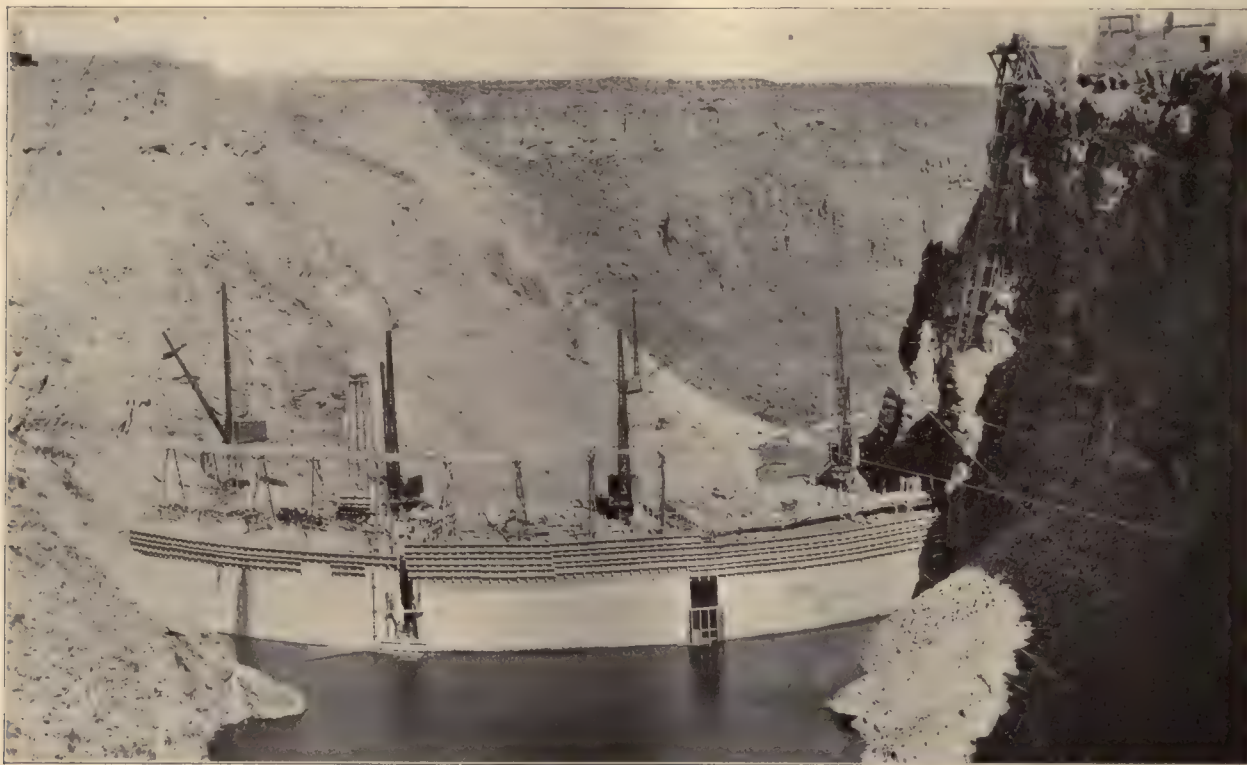
4, 5, 6, 7, 9. Regulations governing subject of maps, field notes, lists of lands and contracts.

8. Regulations governing rights of way over public lands.

10, 11, 12, 13, 14, 15, 16, 17, 18. Regulations governing the state's application for patent and their disposal by the Department of the Interior.

REGULATIONS ADOPTED PURSUANT TO AMENDMENT OF MARCH 15, 1910.

The state official will be required to file in the local land office within which the lands lie an application therefore accompanied by an exhibit and statements as specified in regulation 3.



Salmon River Irrigation Dam. View Looking North Showing Up-Stream Side of Structure.

term "Desert Lands" excludes lands which produce native grasses sufficient in quantity to make a crop of hay in usual seasons; lands which will produce an agricultural crop of any kind in amount sufficient to make the cultivation reasonably remunerative, and lands which will support a natural growth of trees.

Lands occupied by bona-fide settlers, and lands containing valuable deposits of coal or other minerals are not subject to selection.

3. Before the application of any state is allowed, or any contract is executed, or any segregation of land is ordered, the state must file a map of the land selected, which shall exhibit a plan showing the mode of contemplated irrigation and the source of the water, and must submit data showing that the proposed plan will be sufficient thoroughly to irrigate and reclaim the land and to prepare it to raise ordinary agricultural crops, for which purpose a statement of the state engineer, showing the amount of water available, is needed. The state must, also, submit all further information necessary to enable the

Upon the filing of such application the register will, at once, note the same upon his records and, thereafter, will reject all other applications for the lands, except where such application may have been filed prior to the date of the state's application. He will then, at once, transfer the application to this office for further action, first noting thereon the date of filing.

Within three months after date of the state's application in the local land office, the state must file a further affidavit that the work of surveying and of laying out the proposed irrigation system has actually begun and is being energetically prosecuted.

In event of default of such showing, the withdrawal of the lands will be promptly revoked. All lands discovered to be non-irrigable, for any reason, must be relieved from withdrawal.

"FORMS" PRESCRIBED BY FEDERAL REGULATIONS.

Form 1. Affidavit of engineer who prepared the map and plan of irrigation.

Form 2. Affidavit of state official authorized to make selections of "Carey Act" lands.

Form 3. Certificate of selecting agent.

Form 4. Affidavit of register and receiver of United States Land Office.

Form 5. Contract between United States and the state.

Form 6. Forms for verification and publication of "Lists for Patent."

Form 7. Affidavit of state engineer as to sufficiency of water supply.

Form 8. Forms for published notice of state's request for patent.

"Forms" Prescribed by the States.

(A.) Forms prescribed for use between companies and states (as adopted by the state of Wyoming).

State of Idaho, }
County of } ss.

I,, of.....postoffice, in the county of....., and State of Idaho, being duly sworn, on oath, depose and declare:

That I am a native born (or naturalized) citizen (1) of the United States (or have declared my intention to become a citizen of the United States), of the age of.... years and a resident of, and by occupation

That I intend to reclaim a tract of land under the provisions of chapter 2, of an act of the Legislature of the State of Idaho, entitled "An Act to Provide for a State Engineer, Defining His Duties and Regulating His Compensation, and to Provide for the Acceptance by the State of Idaho from the United States of Certain Lands, and to Provide for the Reclamation, Occupation and Disposal of the Same," approved March 2, 1899.

That the land which I intend to enter and reclaim is



The Salmon River Irrigation Dam, Looking South from the Top of the Cliff. Also Showing Construction Camps.

Form 1. Request and proposal for the segregation of lands (to be addressed to the state board of land commissioners).

Form 2. Typical specifications.

Form 3. Form for affidavit of aridity.

Form 4. Certificate of the engineer making survey (being form 1 of federal regulations).

Form 5. Certificate of the commissioner of public lands (being form 2 of federal regulations).

Form 10. General form of contract between the company and settler.

Form 12. Form agreement of escrow to be used when contracts with settlers are executed before water is ready for delivery.

Form 13. Form of surety company board permitted to be furnished by Carey Act companies.

Form 14. Form for application for right of way over state lands.

(B.) Forms prescribed for use between companies and settlers (as adopted by the state of Idaho).

All affidavits to be subscribed and sworn to before the officer before whom entry or final proof is made.

FORM A.

Application to Entry.

Under the provisions of the act providing for the acceptance of arid lands by the state of Idaho.

situated in the County of.....in the State of Idaho, and is described as follows: The.....of Section No....., Township No....., Range No., containingacres.

I further depose and say that I desire to make entry of said land for the purpose of actual reclamation, cultivation and settlement in accordance with the act of Congress in relation to the selection of desert lands by certain states, approved August 18, 1894, and the laws of the State of Idaho supplemental thereto, and that I have never received the benefit of the provisions of such act of Congress, or of the act providing for the acceptance of arid lands by the State of Idaho, approved March 2, 1899, to an amount greater than one hundred and sixty acres, including the number of acres specified in the within application, except (2)

And I present herewith a certified copy of a contract, made and entered into with....., wherein I have acquired a proportionate interest in the canal of said..... together with all rights and franchises attached thereto, representing a sufficient carrying capacity to provide water for the complete irrigation and reclamation of the lands herein described.

This application for entry is made subject to all grants or reservations for right-of-way for the said canals, laterals or reservoirs of the said irrigation system over or upon the lands described herein, the said grants or reservations being shown upon the official plats upon which this entry

is recorded.

Witness my hand and seal, this day of.....
A. D. 190..

In presence of.....

1. In case the party has been naturalized, a certified copy of his certificate of his naturalization must be filed, the words or phrase in the parenthesis to be erased, or the words not used to be erased.

2. If the applicant has at any time previous entered any land under the provisions of this act, he shall so state in his application, giving a description of it and the nature and location of said land.

State of Idaho, }
County of } ss.

I hereby certify that the foregoing affidavit was read to the applicant in my presence, before he signed his name thereto; that said applicant is to me personally known (or he has been satisfactorily identified before me by), and I fully believe him to be a credible person and the person he represents himself to be, and that this affidavit was sworn to before me on the..... day ofA. D. 190.., at my office.....

(Seal) Notary Public for.....County, Idaho,
and Representative of the State Board
of Land Commissioners.

FORM B.—ORIGINAL CERTIFICATE OF ENTRY.

Entry No.....

State Board of Land Commissioners.

.....Idaho,
....., 190..

It is hereby certified that, under the provisions of an act of the Legislature of the State of Idaho, approved March 2, 1899, entitled, "An Act to Provide for a State Engineer, Defining His Duties and Regulating His Compensation, and to Provide for the Reclamation, Occupation and Disposal of the Same,"whose post-office address isappeared before me this.....day of190.. and made application to enter the following described land, to-wit:

....., Tp....., R.....of Boise Meridian, and that he has paid to the State of Idaho, through me, the sum ofdollars, being at the rate of twenty-five (25) cents per acre.

(Seal)

Notary Public for.....County,
Idaho, and Representative of the
State Board of Land Commissioners.
Boise, Idaho,190..

This is to certify that at a meeting of the State Board of Land Commissioners, duly held in the office of said Board, this.....day of190.., the application referred to in the foregoing certificate was examined and the same is hereby approved.

Governor and President of the State Board
of Land Commissioners.

Attest:

Register State Board of Land Commissioners.

FORM C.—NOTICE FOR PUBLICATION.

Companies' Notice That Water Ready for Delivery.

To Settlers Under the.....Canal:

Notice is hereby given in pursuance of the provisions of an act of the Legislature of the State of Idaho, commonly known as the Carey Act, approved March 2, 1899, that.....is now prepared to deliver water for irrigation from said canal system to any one who may have entered, under the provisions of said act, any of the following described land, to-wit:

(Name of Company.)

By.....

FORM D.—PROOF OF CULTIVATION.

Entryman's Affidavit.

I,, of, having on theday of....., 190.., made Entry No..... under the provisions of an act of the Legislature of the State of Idaho commonly known as the "Carey Act," of the.....of section.....in township.....of range....., containingacres, to be irrigated by theCanal, that having on theday of190.., received notice by publication that water was available for use from said canal, do solemnly swear that during the.....year, after receiving such notification, that is after the.....day of....., 190.., and before the.....day of....., 190.., I cultivated by irrigation.....acres of land embraced in said entry, which is more than on.....of the area of such tract; that the crops now grown consist of.....

Entryman.

Sworn to and subscribed before me thisday
....., 190..

Notary Public for.....County, Idaho,
and Representative of the State Board
of Land Commissioners.

This proof should be made before the representative of the State Board of Land Commissioners, and by him transmitted to the Board at Boise.

FORM E.—PROOF OF CULTIVATION.

Deposition of two witnesses in this form to be taken separately.

I,, of, do solemnly swear that I am well acquainted with.....of sectiontownshipof range.....containingacres, embraced in entry No....., made under the provisions of an act of the legislature of the State of Idaho, commonly known as the "Carey Act," and that sinceday of190.., and before the.....day of190..,acres oneof the land embraced in said entry were cultivated by irrigation, that the crops consist of.....and that the water for such irrigation was obtained from theCanal.

Witness.

Sworn to and subscribed before me this.....day of
....., 190..

Notary Public for.....County, Idaho,
and Representative of the State Board
of Land Commissioners.

FORM F.—NOTICE FOR PUBLICATION.

Final Proof.

I,, of, who made entry No....., under the provision of an act of the legislature of the State of Idaho, commonly known as the "Carey Act," approved March 2, 1899, which embracesof section....., township.....of range....., do hereby give notice of my intention to make final proof to establish my claim to the land above described, and that I expect to prove that I have resided on, reclaimed and cultivated said land as required by law before.....at....., on....., 190.., by two of the following witnesses:

Entryman.

.....of.....
.....of.....
.....of.....
.....of.....

The above notice properly filled out and signed by the entryman, together with the fee for its publication, shall be sent to the Secretary of the State Board of Land Commissioners at Boise, who will authorize its publication during the four weeks preceding the date set for making proof, in the newspaper designated by said entryman.

FORM G.—FINAL PROOF.**Deposition of Entryman.**

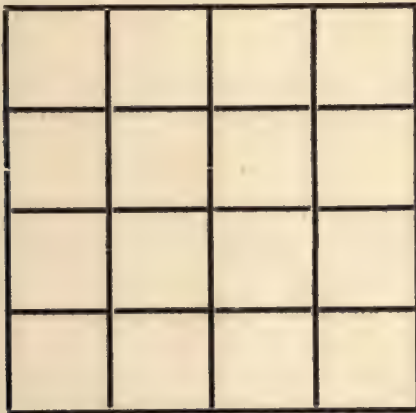
Entry No., made under the provisions of an act of the legislature of the State of Idaho, commonly known as the "Carey Act," approved March 2, 1899., being duly sworn, depose and say that I am years of age, a by occupation, that my residence is and postoffice address and am a citizen of the United States, that on the day of 190..., I made entry No., embracing of section township of range containing acres, which together with other lands entered by me under the provisions of this act, amount to acres, such other lands being described as follows:

..... that the lands embraced in this entry are susceptible of irrigation and reclamation from the Canal; that I hold by purchase water rights or shares in said canal system which represent a carrying capacity in said canal of cubic feet per second, and the right to conduct therein for the use on each acre of the tract embraced within this entry of not less than acre feet of water during each and every irrigating season which quantity is sufficient for the complete reclamation of said tract; such rights or shares also representing a proportionate interest or ownership in said Canal and all its rights and franchises; such rights and interests being evidenced by a certified copy of contract and deed thereto, submitted herewith, and marked Exhibit A; that since notice was received by me on the day of 190..., that water was available in said canal system for the irrigation of said tract, I have resided on said tract (state fully the nature of such residence); that since receiving such notice I have cultivated by irrigation acres of the tract embraced in said entry, that the crops grown thereon consisted of (describe fully the crops grown or growing); that other crops consist of (describe fully such improvements); that from personal knowledge water was conducted upon acres of said tract; that miles of main lateral ditches are now constructed on said tract.

(Draw in the space below a diagram showing the tract embraced in the entry upon which shall be indicated the portion cultivated; the main lateral ditches, giving the dimensions and capacity of each; also any high points which cannot be irrigated from this or any other system, showing the extent and area of same. If the tract is crossed by any natural running water indicate the same and describe it fully in relation to the lands adjacent thereto.)

SKETCH OF ENTRY No.

Embracing of section Tp., R. of Boise Meridian.



That upon no portion of this tract can agricultural crops be produced without the aid of irrigation, except (describe the portion, if any): that I entered this land for my sole benefit, that I have the sole and entire interest in the

same, and that no individual, company or corporation has any interest whatever in said entry, excepting (describe fully the nature of such interest, if any).

Sign name in full 190..

I hereby certify that the foregoing testimony was read to the claimant before being subscribed, that I believe him to be the person he represents himself to be, and that said testimony was subscribed and sworn to before me at my office in on the day of 190..

State official title

FORM H.—FINAL PROOF.

Deposition of two witnesses in this form to be taken separately. Entry No., made under the provisions of an act of the legislature of the State of Idaho, commonly known as the "Carey Act," approved March 2d, 1899.

I, being duly sworn, depose and say that I am years of age, a by occupation, that my residence is and postoffice address that I am acquainted with who made entry No. under the provisions of said act, which embraces of section township of range containing acres; that I am well acquainted with the said land, having been over and upon every legal sub-division of the same, that upon the day of 190..., I saw water in sufficient quantity for the complete irrigation of the entire tract distributed through the main laterals constructed on said land for the irrigation thereof, that there are miles of main distributing laterals constructed on said land (state dimension and capacity of said laterals) that acres embraced within said entry have been cultivated by irrigation and produced (describe fully crops produced); that said land receives water for irrigation from the Canal, being miles distant from the same; that said water is delivered by means of a main lateral ditch, which is (state dimensions of same) at a point distant from said land; that acres of said land can be irrigated and reclaimed by said canal system, and that acres lie above the level of said canal system (state character and extent of land belonging to this tract which cannot be reclaimed by this or any other canal system); that the entryman owns and controls water rights or shares in said Canal, which represent a carrying capacity in said canal of cubic feet per second; also a proportional interest or ownership in such canal with all its rights and franchises; also that this interest in said works gives him the right to conduct through the same for the use on each and every acre of land embraced in said entry of acre-feet of water to be delivered to him during each and every irrigating season, which quantity of water is sufficient for the complete reclamation and irrigation of said tract; that upon no portion of this tract can agricultural crops be produced without the aid of irrigation, except (describe the portion, if any); that the said entryman has resided upon this land since the day of 190..., (state fully nature of such residence); that I have no interest, either direct or indirect in this entry, nor in the land covered thereby except (state nature of such interest, if any); that no coal or other minerals have been discovered on said land, neither are any such known by me to be contained therein, neither do indications of mineral of any kind exist on said land, except; (state extent of mineral deposit and describe indications of minerals, if any).

Sign name in full

I hereby certify that the above testimony was taken and subscribed before me this day, and that the same was read to the witness in my presence before he signed his name thereto, that I believe the witness to be the person he represents himself to be, and that said testimony was subscribed and sworn to before me at my office on the day of 190....

State official title

FORM I.—NON-MINERAL AFFIDAVIT.

To accompany evidence submitted in final proof to entry No..... made under the provision of an act of the legislature of the State of Idaho, commonly known as the "Carey Act," approved March 2d, 1899.

(This affidavit can be sworn to only on personal knowledge, and cannot be made on information and belief. The non-mineral affidavit accompanying an entry of public land must be made by the party making the entry, and only before the officer taking the other affidavits required of the entryman.)

....., 190....
.....being duly sworn according to law, deposes and says that he is the identical.....who is an applicant for government title to the.....; that he is well acquainted with the character of said described land, and with each and every subdivision thereof, having frequently passed over the same; that his personal knowledge of said lands is such as to enable him to testify understandingly with regard thereto; that there is not, to his knowledge, within the limits thereof, any vein or lode of quartz or other rock in place, bearing gold, silver, cinnabar, lead, tin or copper, or any deposit of coal; that there is not within the limits of said land, to his knowledge, any placer, cement, gravel or other valuable mineral deposit; that no portion of said land is claimed for mining purposes under the local customs or rules of miners, or otherwise; that no portion of said land is worked for mineral during any part of the year by any person or persons; that said land is essentially non-mineral land, and that his application therefor is not made for the purpose of fraudulently obtaining title to mineral land, but with the object of securing said land for agricultural purposes, and that his postoffice address is

I hereby certify that the foregoing affidavit was read to affiant in my presence before he signed his name thereto; that said affiant is to me personally known (or has been satisfactorily identified before me by.....), and that I verily believe him to be a credible person and the person he represents himself to be, and that his affidavit was subscribed and sworn to before me at my office in.....on this.....day of....., 190....

.....
State official title.....

FORM J.—FINAL CERTIFICATE.

Entry No....., Idaho
....., 190....

It is hereby certified that under the provisions of an act of the legislature of the State of Idaho, approved March 2d, 1899, entitled, "An Act to Provide for a State Engineer, Defining His Duties and Regulating His Compensation, and to Provide for the Acceptance by the State of Idaho from the United States of Certain Lands, and to Provide for the Reclamation, Occupation and Disposal of Same," commonly known as the "Carey Act" and the acts amendatory thereto.....whose postoffice address is.....appeared before me this.....day of....., 190...., and submitted evidence of the reclamation, cultivation and settlement of entry No., embracing the.....of section....., township....., of range....., containingacres, and has paid to the State of Idaho, through me, the sum of.....dollars, being at the rate of twenty-five (25) cents per acre, being the final payment on said land.

.....
Official title.....

Boise, Idaho, , 190....

This is to certify that at a meeting of the State Board of Land Commissioners, duly held in the office of the said Board, this.....day of....., 190...., the evidence of reclamation, cultivation and settlement of the land embraced in entry No....., referred to in the above certificate, was examined and the same is hereby approved.

.....
Governor and Chairman State Board
Land Commissioners.

Attest:

.....
Register and Secretary State Board of
Land Commissioners.

ASSIGNMENT OF ENTRY.

Entryman's Affidavit.

For value received, I do hereby transfer, assign, and set over to....., his heirs and assigns, forever, all my right, title and interest in and to that certain tract of land described as follows:

Said tract of land having been entered by me as per certificate of entry No....., issued by the State Board of Land Commissioners of the state of Idaho on the....day of....., 191... Also all my rights, title and interest in, to and under a certain contract with the....., the said contract being numbered.... and dated....., 191....

In presence of

.....
State of Idaho, } ss.:
County of }

On this....day of....., 19...., before me, , a notary public in and for said county, personally appeared , known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same.

In Witness Whereof, I have hereunto set my hand and affixed my seal the day and year in this certificate above written.

.....
Notary Public.

Know All Men by These Presents, That assent is hereby given to the assignment of original water contract No....., by..... to....., so far as our interest may appear, and we hereby certify that the transfer to.....of all the interest in the canal system contracted for by the original entrymen, has been entered on the books of the company.

.....
by.....

Witnesses:
.....
.....

FORM K.—AFFIDAVIT OF ASSIGNEE.

I, of....., claiming to be the assignee of....., who made entry No....., on theday of....., 190...., under the provisions of an act of the legislature of the State of Idaho, commonly known as the "Carey Act," approved March 2, 1899, do solemnly swear that I am a bona fide resident citizen of the state or territory of.....and a citizen of the United States, or I have declared my intention to become a citizen of the United States; that the said....., who made said entry, did, on the.....day of....., 190...., transfer his right thereunder to me, by virtue of instrument in writing, of which a certified copy is herewith attached; and further, that I do not hold by assignment or otherwise, more than one hundred and sixty (160) acres of land entered under said act, the only lands so held by me being described as follows:section.....township range....., being entry No....., and that I possess all the qualifications necessary to make an original entry under the provisions of said act, of the land embraced in entry No....., of which I am the assignee.

.....
My postoffice address is:

Sworn to and subscribed before me this.....day of....., 190...., at my office in.....county,

POWER OF ATTORNEY.

Know All Men by These Presents: That I, of.....postoffice, in the County of..... and State of....., do hereby make, constitute and appoint..... of.....my attorney

(Continued on page 466.)

A PERFECT SYSTEM OF IRRIGATION

The Wonderful Achievements of the Amity Canal and Reservoirs Project in Colorado

[Correspondence.]

Twelve years ago a desert, barren waste of rolling prairie, where no human habitation dispelled the loneliness, where the coyote and prairie dog played amidst the sage brush, the only vegetation which made pretense of existing on this arid plain: Today a fertile verdant tract of land, a veritable garden of Eden, where growing alfalfa, waves waist high in the breeze, where sugar beets and cantaloupes flourish as nowhere else in the country, and where fruit orchards and rolling fields of small grain add



Alfalfa Field on the Property of the Arkansas Valley Sugar Beet & Irrigated Land Co., near Holly, Colo.

to the beauty of this one-time desert and to the independence of the homeseeker who was far-seeing enough to choose a home where he was master of his own rainfall and was sure that each year would add to his rapidly growing bank account.

This is the story "in a nut shell" of the remarkable changes that have reclaimed the 70,000 acres of arid land belonging to the Arkansas Valley Sugar Beet & Irrigated Land Co., and made it into the homes of thousands of prosperous farmers.

Irrigation is the method whereby these wonderful changes have come about, and through irrigation alone could anything but sage brush be made to grow in so arid a country.

The Irrigation System of the Arkansas Valley Sugar Beet & Irrigated Land Co. is one of the best in the world. Its main canal is 80 miles long, having its source in the Arkansas River at Prowers, Colorado, and flowing eastward, it winds around hills, is flumed over valleys and syphoned under creeks until it reaches the Kansas line.

All structural work of the canal system is the best known to the methods of modern engineering. Its flumes, drops, syphons, bridges, dams and wiers are all of reinforced concrete. The diversion dam in the Arkansas river alone cost \$125,000. It is built from bedrock, is 504 feet long, and has an average height of 28 feet.

At one place the canal, as if ashamed of its tranquil flow, suddenly plunges out of sight and after tumbling about below the surface of the earth for about a quarter of a mile it again thrusts its head into the sunlight and pursues its even way. The reinforced concrete syphon which effects this wonderful performance is alone a perpetual monument to the achievements of modern engineering. The building of this syphon cost \$290,000.

The spending of all these hundreds of thousands of dollars alone was not enough. No irrigation project is

complete without having an abundance of storage water from which to draw in case the river should be low during the irrigation season. The management of this far-seeing company did not wait to learn if the river would get too low for them to get water in their canal; did not wait to see their crops burn up in the sun, but at once proceeded to develop a great chain of reservoirs, northwest of their land, which alone hold enough water to irrigate all their land for two years in succession should the river be low that length of time. These reservoirs cover an area of 13,000 acres of land, have a shore line of sixty-four miles, and if the water were all put in a canal a foot deep and a mile wide the canal would be over 400 miles long. These reservoirs are filled from the Arkansas river during flood seasons, and winter months. The inlet canals are over 100 miles long, taking their origin east of Rocky Ford, Colorado. The outlet canal plunges from the level of the reservoirs 279 feet in a distance of 15 miles, where it joins the main Amity canal below. To prevent the washing out of the canal bed by this rush of water, reinforced concrete drops have been built at the expense of thousands of dollars.

Fifty thousand acres lying under this canal system out of the original 70,000 acres have been sold. This has been divided into forty-acre farms, on which have been erected neat cottages, and here lives and thrives the thrifty farmer of the West. Here he raises the wonderful Western crop—alfalfa hay.

If he is a good husbandman he makes four cuttings a year, and gets three to five tons per acre. He sells his hay to the alfalfa mills, two of which have recently been built on this land, for eight dollars per ton, and as the cost of raising alfalfa is very small he has a big profit on this crop alone.


Colorado has more sugar factories, raises more sugar beets and makes more sugar than any other state in the Union. The Holly Sugar Company, a corporation under the same management as the A. V. S. B. & I. L. Co., is capitalized at \$5,500,000. It has two factories, one at Holly,



Cattle Feeding Yards of Arkansas Valley Sugar Beet & Irrigated Land Co., Holly, Colo.

in the heart of the land which we are describing, and one at Swink, 85 miles up the valley. The factory at Holly is capable of handling 600 tons of beets per day. It buys the beets from the farmer, delivered on the Holly & Swink Railroad, which was built especially for this purpose, at

(Continued on page 473)



The
"FLOUR CITY"
TRACTOR

BUILT IN TWO SIZES---30 AND 40 H. P.

**A GENERAL FARM ENGINE OF THE MOST
 MODERN DESIGN AND CONSTRUCTION.**



The "FLOUR CITY" is made to meet the demands for a Strong, Light and Economical Farm Tractor. That it does this is best attested to by its being

TWICE WINNER OF THE GOLD MEDAL

of the International Motor Contest at Winnipeg in 1908 and 1909. It is further attested to by hundreds of these engines now in the field, and by the fact that our 1909 business required us to double our capacity, and the demand for 1910 requires us to do so again.

843 SEND FOR OUR CATALOGUE.

KINNARD-HAINES CO.,
42TH AVENUE NORTH AND BRYANT
MINNEAPOLIS, MINN.

Decisions of the Department of the Interior and of the Public Land Office

Homestead Entry—Death of Entryman—Right of Widow—Heirs of Mojck v. Widow of Mojck, March 16, 1910.—Upon the death of a homesteader prior to consummation of his claim his widow, if there be one, succeeds under the homestead law to his right to the land; and the State courts have no jurisdiction to interfere with or divert the succession so fixed by federal statute.

Additional Homestead Under Section 3 of the Act of February 19, 1909.—Clinton Browning, March 18, 1910.—A homesteader who made entry under the general law, upon which patent has issued, is not entitled to an additional entry under Section 3 of the act of February 19, 1909. (320 acre homestead act.)

Public Lands—Aggregate Area—Act of August 30, 1890—Courtier v. Hogan, March 18, 1910.—Lands embraced in entries made prior to the act of August 30, 1890, or in settlements made prior thereto and subsequently carried to entry, are not considered in determining the quantity of lands a settler or entryman may acquire under the limitation in that act

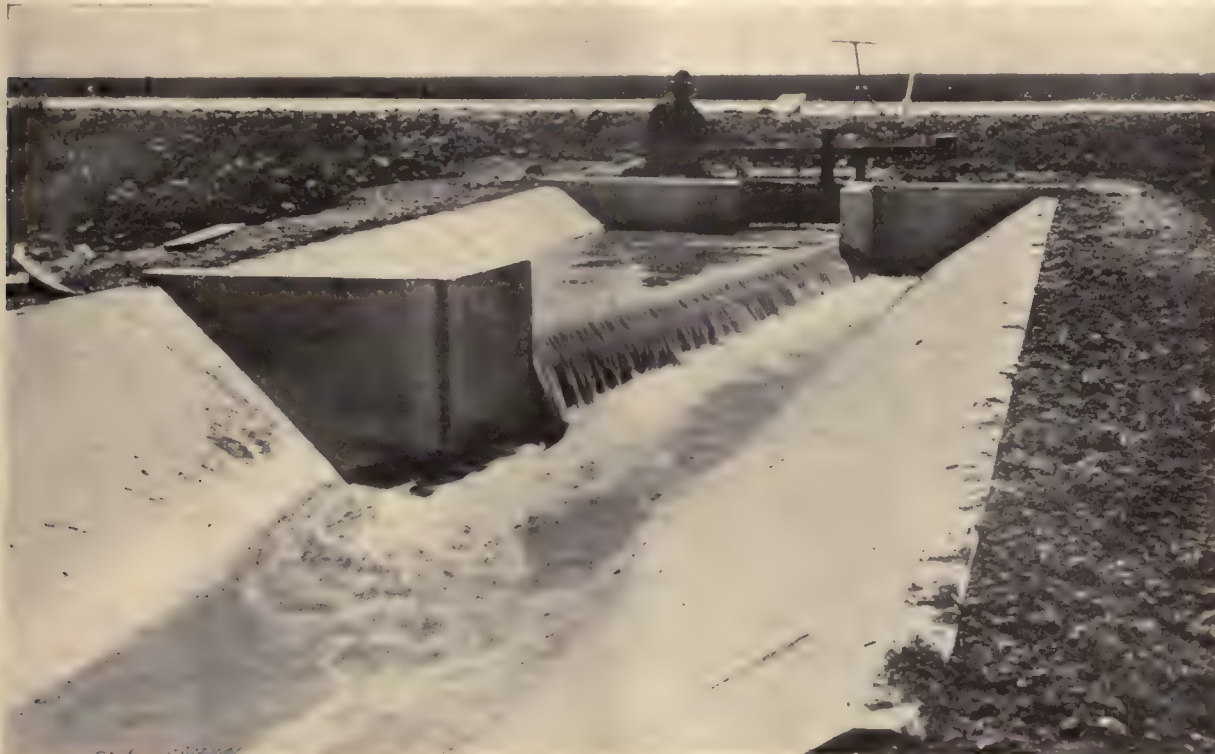
Office and is pending before the department on appeal is not, in such case, sufficient reason for refusing to accept a contest against the entry based upon a charge, which, if proven, would necessitate cancellation of the entry.

In a contest against a homestead entry on the ground of abandonment it is not necessary, under the act of June 16, 1898, to either allege or prove that the entryman's absence was not due to military service, where the United States was not engaged in war during the period of abandonment. Credit for constructive residence during absence on account of official employment cannot be allowed where actual residence has never in good faith been established.

National Forest Homestead—Qualification—Acts of August 30, 1890, and June 11, 1906—William P. Wall, April 14, 1910.—One who since the act of August 30, 1890, has acquired title to 320 acres, in the aggregate, under the agricultural public land laws, is disqualified to make entry in a national forest under Section 2 of the act of June 11, 1906.

Right of Way—Reservoir Site—Application—Discretionary Power of Secretary—Sierra Ditch and Water Co.—Whenever, in his judgment, the granting of an application for right of way under the act of March 3, 1891, over a national forest or reservation, would interfere with the proper occupancy of the reservation by the Government, it is within the power of the Secretary of the Interior to withhold his approval therefrom.

Prior to approval the inchoate right acquired by an application for right of way over a national forest under the act



Showing Weir Conducting Water from Main Canal to Lateral, Patterson Ranch, California.

that not more than 320 acres in the aggregate may be acquired by any one person under the public land laws.

Carey Act—Coal Classification Subsequent to Approval of Segregation List—Act of March 2, 1909—State of Wyoming, March 19, 1910.—No complete equitable interest or title vests in a state by the approval of a segregation list under the Carey Act; and if, subsequent to such approval and prior to final approval of the patent list, lands in the segregation list are classified as coal, the department is without authority, so long as such classification stands, to approve or patent such lands to the state except in accordance with the act of March 3, 1909.

Insane Entryman—Residence—Act of June 8, 1880—Welsh v. Hackett, March 30, 1910.—The homestead entry of one who became insane before expiration of six months from entry, without having established residence, is not protected by the act of June 8, 1880.

Homestead—Commutation Proof—Residence—Mary E. Elson, April 5, 1910.—Commutation proof upon an entry made prior to November 1, 1907, submitted immediately after the expiration of fourteen months from date of entry, showing that residence was not established until just before the expiration of six months and that the entryman was absent an intermediate period of about two months during the succeeding eight months, will not be accepted as sufficient.

Contest—Abandonment—Military Service—Constructive Residence—McKeen v. Johnson, April 14, 1910.—Rejection of the commutation proof offered by a homestead entryman does not necessarily, in the absence of an adverse claim, and where sufficient time remains within which the entryman may comply with law and submit new proof, result in cancellation of the entry; and the fact that commutation proof was rejected by the local officers and the General Land

of March 3, 1891, is subject to the power of Congress to deny the right by intervening legislation affecting the land.

SUPREME COURT NOTE.

RIGHT TO CONSTRUCT DAM.

One who had a prior appropriation of surplus and flood waters in a gulch or wash could construct a dam above a subsequent appropriator, and impound so much of the water falling above it as he required for beneficial purposes, but must maintain the dam so as to permit such water as he does not require to pass to the lower appropriator, and so construct the dam as not to endanger the dam of the other appropriator.—*Sullivan v. Jones*. Supreme Court of Arizona. 108 Pacific 476.

ACQUISITION OF RIGHT TO USE WATERS.

An owner of land bordering on a stream, who, by means of ditches, used the waters thereof for irrigation and allowed the waters to run through his own ditch across his land and permitted his neighbors to make use of it as they desired, but who did not by any act give his neighbors reason to believe that such permission was to be permanently continued, or that it would be recognized as a right, was not estopped from denying that his neighbors had any right to the ditch or waters.—*Davis v. Martin*. Supreme Court of California. 108 Pacific 866.

A GOD-GIVEN LAND MONOPOLY.

Wonderful Value of the Kuhn Irrigation Project in the Sacramento Valley of California.



MAJOR E. E. CRITCHFIELD.

Major E. E. Critchfield of the Long-Critchfield Corporation, Chicago, visited the Sacramento Valley, California, recently to inspect the J. S. & W. S. Kuhn irrigation project and upon his return was asked to address the salesmen connected with the office of H. L. Hollister, in the Home Insurance building. Besides the salesmen there were present a number of people who were planning to make a trip to California to get acquainted with this wonderful enterprise.

Major Critchfield's remarks will be found very interesting to every person who has considered the subject of irrigation. He said in part:

"I don't wish to say anything that might by any possibility jar upon the sensibilities, but I do want to express in just one short sentence what I think of the Sacramento Valley in its original condition. And as it was before the Kuhns took hold of it. It is the best illustration of God-given natural monopoly and man-neglected opportunity that I have ever seen anywhere or under any conditions.

You gentlemen, who are selling land to people who contemplate residence in the Sacramento Valley, may lay it as a flattering unction to your souls that you cannot by any possibility misrepresent this proposition.

Don't misunderstand me. Do not guess at what I am saying. I have said exactly what I mean. And without any egotism I think I have the right to say to you that I know this is so from the fact that there is not any considerable irrigation project in any section of the country that I have not seen and that I am not more or less familiar with.

This knowledge even goes to an acquaintance with the character of the soil—something of the productivity of that soil, its crop rotations, its ability to produce this, that or the other thing by reason of its elevation above sea level.

I know also much of the men and means behind these several projects. And I wish to say to you, in the light of this observation and experience, that you cannot by any possibility be too enthusiastic about this great Sacramento Valley project.

Some of you who contemplate going to the Sacramento Valley, or are considering the purchase of land in this great valley, may be interested in knowing that you may find there practically any particular kind of soil which you desire.

If you desire to specialize in some particular kind of fruit or crop, by taking just a little time, you will find in that mighty domain the soil exactly suited to your wants or the requirements of the particular thing which you desire to produce. Nature has indeed been prolific in the blessings with which she has endowed this great valley.

If you desire a sandy loam, you can find it there.

If you prefer a black loam, you can find it there.

Should you prefer a muck soil, it is there.

Should you like the light, higher lying gravel soil, it is also there.

Now, so far as the distribution of these several soils and the general adaptability of the valley to the production of various growths, fruits, etc., you have nothing to do but to go and see for yourself.

If you really wish to know whether it grows oranges, just go over to the orange grove which is already growing and bearing, and ask the man. Indeed, I think it perfectly safe to say that the prize orange grove of the entire state of California is right here in this Sacramento Valley project.

Should you wish to know whether olives grow in the Sacramento Valley, just go over to the olive grove and find out. Ask the man. As I did. He is there. And he

will be able to tell you just what they produce. Indeed, he will be able to give you the exact figures.

If you want to know whether prunes can be just as successfully produced in that country, go again to the prune orchard, and ask the man. The orchard and the man are there, both ready and willing to speak for themselves.

Now, what I have said before is true of the entire valley so far as it is covered by the operations of the Sacramento Valley Irrigation Company. Nature has surely been lavish in her gifts to this great valley. Indeed it would seem that you can grow anything there. Almost anything that mortal man desires to grow.

As to strawberries—the answer was on the table at breakfast in the morning, and I wish to go upon record as saying that if the famous "east shore" of Michigan ever produced anything better in the way of strawberries, I have not seen it, and certainly am not able to discern any difference in the product.

One thing which impressed me in a most abnormal way was the wonderful possibilities for diversification in the valley. Gentlemen, when a probable purchaser asks you whether any particular crop may be successfully grown in the Sacramento Valley, just shut your eyes and say "Yes."

You may add, "I have not seen it, but I know that it can be grown there."

This may seem like a rather bold declaration but I assure you that it is the absolute truth. I made a list of numerous things which I saw growing there. I shall not take the time to name these things to you now, but it really seems to make very little difference what you want to grow in the Sacramento Valley, you can find it growing there in such a way as to answer practically every question which you may desire to ask.

California, of course, is the best known and most famous for its production of grapes, raisins, oranges, figs, etc., but let me tell you, gentlemen, that in this same Sacramento Valley I saw more alfalfa growing on one acre than I have ever seen growing on a single acre elsewhere, and when they assured me that it could be cut more frequently than I have ever known it to be cut east of the Sierras, I was ready to believe it because again of that wonderful and perpetual sunshine in conjunction with added moisture.

If I were going to the Sacramento Valley to live and wanted in the beginning something which would bring the dollars quickly, I would certainly put some portion of my land into alfalfa and buy a few cows.

A wheat man who has 4,700 acres of wheat this season said to me upon inquiry, "Mr. Critchfield, my cow is in a tin can and my hogs are done up in a gunny sack and properly smoked when they come to me."

This is one of the reasons why your market is at your door. You see the farmer in the Sacramento Valley as he has existed heretofore, thinks that nothing can be done without a Stockton Gang and twelve mules in front of him. If it is anything which cannot be done with twelve mules, in his mind it cannot be done at all. At least he would not know how to do it.

You can readily observe that it is an impossibility to milk a cow even by the aid of twelve mules.

This is your opportunity. One which is being embraced by people already upon the ground and which will be embraced by others.

Before closing I wish to pay the highest compliment of which I am capable to Mr. Ross and his assistants for the extraordinary, and I think unequalled, system of engineering on this project.

While in the engineer's office, I asked indiscriminately for blue print descriptions of this, that and the other particular 40. My desire was to follow out the contour lines on as many separate 40's as I desired to form a basis of judgment of the engineering.

And I say unhesitatingly that I have never seen anything applied to either irrigation or drainage—the putting of the water upon the land, or the carrying of the water from the land, that will equal the system as inaugurated on this project.

The aim has been to bring all the contour lines down to six inches and in many instances lines run down beyond that point. (Continued on page 474.)

Cripple Creek the Famous

Delights of a Journey Over the Colorado Springs & Cripple Creek District Railway from Colorado Springs to the Big Gold Camp.

ONE of the most delightful trips available to the members of the National Irrigation Congress is over the "Short Line," as the Colorado Springs and Cripple Creek District Railway is known, from Colorado Springs to the famous mining district. When this road was finally constructed and it became known that it was possible to go to the greatest gold camp on earth in perfect comfort and safety, directly over the wildest part of the mountains, the information caused the greatest satisfaction to the thousands of tourists who visit Colorado but who had never been able to make this trip. The "Short Line" is in itself a marvel of construction. It winds its serpentine way over the top of great peaks and across almost fathomless depths, revealing at every turn new scenes of beauty and grandeur.

The intrepidity of the thought which conceived and the marvelous engineering skill and daring which achieved a broad-gauged, well-built railroad through such

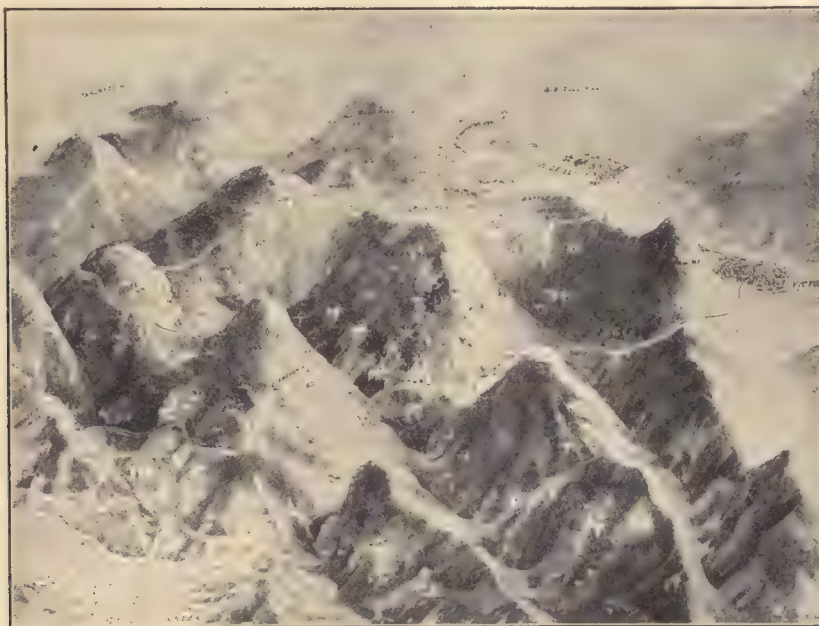
a flowering cherry or haw bush, all exquisitely blended with the russet browns and deep reds of the granite crags, which jut out far above them.

As the train leaves Point Sublime and threads its way along the sides of the great canyons and around and through the endless succession of cliffs the scenes present an everchanging panorama of nature's beauties until the road reaches a height of more than 10,000 feet.

At a point on the road called St. Peter's Dome the passenger is two miles above the level of the sea, but still towering high above him is this majestic dome of rock-ribbed earth, a huge mass of granite that stands a silent and masterful sentinel of the ages.

When the traveler views this mighty pile lifting high above him he cannot believe that any railroad could be constructed that could scale its dizzy heights. But the train proceeds steadily upward, and as it glides quietly along over the smooth but winding iron path, grandeur succeeds to new grandeurs and rapture to rapture in ever-changing but never-ending charms. So absorbed is the passenger in the scenes about him, and the height is obtained with so much ease and so quickly that he is scarcely aware that only a few moments before he was straining his eyes in trying to see the point in the clouds where he is sitting now in wondering admiration.

Now the train is entering the famed gold camp that has added millions of dollars to the world's wealth, and which is yet destined to add more millions. The famous



The Great Cripple Creek Gold Mining District.

mountains and over such ledges almost shakes the credulity of even those who have passed over it. The road wide, the track full standard width, laid with 75-pound steel rails, heavy ties, and solidly ballasted with crushed granite, insuring not only perfect safety but a smoothness which is not equalled by many level roads in the country.

The locomotives are monsters of their kind, weighing 190,000 pounds and possess a tremendous pulling power. The passenger cars are of modern standard make, richly upholstered, finished in rare woods and brightly illuminated. To every train are attached observation cars, and these prove one of the most attractive features of the road, as they enable passengers to get a perfect view of every bit of passing scenery.

At Point Sublime the trains stop for several minutes in order that passengers may alight and get a better view of one of the most marvelous bits of scenery in the world. This a sheer, unbroken declivity of pinkish granite, fully a half mile in height, the lower part covered with the tender green of the aspen and higher up with the darker verdure of the pines and cedars, brightened here and there with

Bull Hill, the scene of more than one bloody conflict, between miners and mine owners, is seen close by the little town of Altman, which is conceded to be the highest incorporated town in the world. It lies more than 12,000 feet above the level of the sea.

Aside from the beauties of this trip from Colorado Springs across the mountains, the visitor will thoroughly enjoy the interesting scenes in the wonderful little city of Cripple Creek which has sprung up in the midst of the granite peaks which have yielded millions of gold and whose characteristics are of deep interest to every visitor.

Send \$2.50 for The Irrigation Age
One Year and
The Primer of Irrigation
Cloth Bound

Department of Agriculture— Latest Publications.

MONTHLY LIST

[To obtain those publications to which a price is affixed, application must be made to the **Superintendent of Documents, Government Printing Office, Washington, D. C.**, to whom all remittances must be directed. **Stamps and personal checks will not be accepted.**

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Publications for free distributions, i. e., those to which no price is attached, may be obtained upon application to the Secretary of Agriculture, Washington, D. C. **Free publications are not distributed by the Superintendent of Documents.** In all cases where officials desire to exchange publications applications should be made to the Department of Agriculture.

The Department of Agriculture **does not distribute nor control the distribution of publications of the State Agricultural Experiment Stations.** Application for them should be made to the several stations in the different states.

A List of Publications for free distribution revised to April 1, 1910, and a separate list of publications for sale (by the Superintendent of Documents) revised to October 1, 1909, may be procured free of charge upon application to the Secretary of Agriculture, Washington, D. C.]

Annual reports of Department, year ended June 30, 1909. 1910.—Cloth, 70 cents. (Bureau of Animal Industry) order 136, amendment 12; April 21, 1910. (1910) 1 p. (Order concerning regulations for certification of associations of breeders of pure bred live stock and books of record of pedigrees.)

BIOLOGICAL SURVEY BUREAU.

Muskrat; by David E. Lantz. April 30, 1910, 38 p. 11. (Agriculture Dept. Farmers' bulletin 396.)

Private game preserves and their future in United States; by T. S. Palmer. May 4, 1910. 11 p. 2 pl. (Circular 72.)

Progress of game protection in 1909; by T. S. Palmer, Henry Oldys, and C. E. Brewster. May 21, 1910. 19 p. 11. (Circular 73.)

CHEMISTRY BUREAU.

Experiments on preparation of sugared dried pineapples; by H. C. Gore. May 14, 1910. 8 p. 11. (Circular 57.)

Use of cold storage, data on cold storage and cold storage products; presented by Mr. Lodge. April 13, 1910. 23 p. 2 pl. Paper, 5c.

ENTOMOLOGY BUREAU.

Anatomy of honey bee (with bibliography); by R. E. Snodgrass. May 28, 1910. 162 p. 11. Paper, 20c.

Papers on cereal and forage insects; Sorghum midge; by W. Harper Dean. May 23, 1910. Paper, 10c.

Some insects injurious to truck crops; Life history and control of hop flea-beetle; by William B. Parker. May 20, 1910. 58 p. 11. 2 pl. (Bulletin 82, pt. 4.) Paper, 10c.

Some miscellaneous results of work of bureau 9: Woolly white-fly new enemy of Florida orange; by E. A. Back. May 7, 1910. (Bulletin 64, pt. 8.) Paper, 5c.

EXPERIMENT STATIONS OFFICE.

Agricultural experiment stations. List of station publications received by office during April, 1910. May 13, 1910. 9 p. (Monthly.)

Agriculture. Institutions in United States giving instruction in agriculture, corrected to May 1, 1910; (by Marie T. Spethmann.) May 23, 1910. 15 p.

Experiment station record, v. 21; index number. April 29, 1910. Cover-title, xiii-801-911 p. *Paper, \$1.00 a vol. (6 nos. 2 abstracts, and an index.)

Experiment station record, v. 22, No. 5; April, 1910. 1910. Cover-title, viii-401-500 p. *Paper, \$1.00 a vol. (6 Nos., 2 abstracts, and an index.)

Experiment station record No. 6; May, 1910. 1910. Cover-title, ix-501-600 p. *Paper, \$1.00 a vol. (6 Nos., 2 abstracts, and an index.)

Food. Care of food in home, corrected to March 25, 1910; by Mary Hinman Abel. 1910. 46-11 p. 11. (Agriculture Dept. Farmers' bulletin 375.) Paper, 5c.

Food—Continued. Principles of nutrition and nutritive value of food, corrected to April 20, 1910; by W. O. Atwater. (3d revised edition.) 1910. 48 p. 11. Paper, 5c.

Irrigation of grain; by Walter W. McLaughlin. May 17, 1910. 23 p. 11. Paper, 5c.

Meat. Economical use of meat in home; by C. F. Langworthy and Caroline L. Hunt. March 21, 1910, corrected April 5, 1910. 43-11 p. Paper, 5c.

Windmills. Use of windmills in irrigation in semi-arid West; by P. E. Fuller. May 3, 1910. 44 p. 11. Paper, 5c.

FOREST SERVICE.

Information regarding employment on national forests. 4th revision. May 14, 1910. 4 p.

Instructions for making forest surveys and maps. Revised Nov. 16, 1909. Feb. 28, 1910. 51 p. 11. map, 16. Cloth, 20c.

Location and area of national forests in United States, Alaska and Porto Rico (Dec. 31, 1909), and dates when latest proclamations became effective. Feb. 2, 1910. 4 p. large 8.

Same. March 31, 1910. 4 p. 4.

Open-tank method for treatment of timber; by Carl G.

Crawford. July 2, 1907 (reprint, 1910, with slight changes). 15 p. 11. (Circular 101.) Paper, 5c.

Wood paving in United States; by C. L. Hill. March 4, 1908 (reprint, 1910, with slight changes). 24 p. 11. (Circular 141.) Paper, 5c.

MAPS.

National forests with transportation routes and supervisors' headquarters, scale 100 m.=1.1 in.; with insets, Alaska, scale 300 m.=1.1 in.; Porto Rico scale 40 m.=1 in. June 30, 1909 (published 1910). 20.1x31.5, 5.1x6.6, and 2.3x3.9 in.

PLANT INDUSTRY BUREAU.

Cultivation of hemp in United States; by Lyster H. Dewey. May 23, 1910. 7 p. 11. (Circular 57.) Paper, 5c.

Methods of legume inoculation; by Karl F. Kellerman. May 28, 1910. 5 p. (Circular 63.) Paper, 5c.

More profitable corn-planting method; by C. P. Hartley. May 27, 1910. 14-11 p. 11. (Agriculture Dept. Farmers' bulletin 409.) Paper, 5c.

PUBLIC ROADS OFFICE.

Construction of concrete fence posts. May 21, 1910. 31 p. 11. (Agriculture Dept. Farmers' bulletin 403.) Paper, 5c.

Information in regard to fabricated wire fences and hints to purchasers; by Allerton S. Cushman, 1910. (From Year-book, 1909.) Paper, 5c.

SOILS BUREAU.

Manure. Composition of commercial fertilizers; by Milton Whitney. May 10, 1910. 39 p. (Bulletin 53.) Paper, 10c.

Manure. Fertilizers for corn soils; by Milton Whitney. May 3, 1910. 31 p. (Bulletin 64.) Paper, 5c.

Manure. Fertilizers for potato soils; by Milton Whitney. May 9, 1910. 19 p. (Bulletin 65.) Paper, 5c.

Manure. Fertilizers for wheat soils; by Milton Whitney. May 26, 1910. 48 p. 11. (Bulletin 66.) *Paper, 10c.



Peerless Woven Wire Fence on the Farm of Aden Crable, at Delta, Colorado.

The above is a picture of a farm at Delta, Colorado, under the famous Gunnison Tunnel, built by the United States Government at a cost of approximately \$6,000,000, to water the land of the Uncompahgre Valley, the finest apple country in the United States, and now with a water right that cannot be excelled.

Mr. Crable's first order was for 480 rods of PEERLESS WOVEN WIRE FENCE for his farm south of town, and was built for the purpose of improving the farm and placing it on the market this spring. Six months after building the fence Mr. Crable sold the place to the Clark Realty Company of Denver and Delta for an advance of \$6,000 over what the farm cost him less than two years ago. Mr. Crable claims that the Peerless wire fence sold the place.

Mr. Crable was so well pleased with his first order of Peerless Fencing that he bought 2,980 rods of No. 1047 (10 lateral wires, 47 inches in height), in March of this year, fencing in the neighborhood of a thousand acres and placing a strand of our single strand, high carbon, corrugated steel Peerless Barb Wire five inches above the top of the woven fencing for the purpose of protecting the fence from being crushed down by hunters, wild range cattle and horses.

**Send \$2.50 for The Irrigation
Age one year and
The Primer of Irrigation
Cloth Bound**

Reclamation Notes

CALIFORNIA.

William Kahrman, a realty dealer of Fresno, California, has interested New York capital in a project to irrigate 2,000,000 acres of land by pumping water from Tulare lake. The tract involved lies between Mendota and Coast Range and is almost flat. It is now without water except where small wells have been put in. It is stated that the New Yorkers have indicated a readiness to make the required investment of \$20,000,000.

Charles Swezy, of Sacramento, has filed in the office of the county recorder of Butte an appropriation of 20,000 inches of water. Of this amount 10,000 inches are taken from Mosquito Creek, and 10,000 inches of the water from French Creek. The filing was made in the name of Anne Swezy. The water of Mosquito Creek will be diverted by a concrete dam 15 feet high and 40 feet wide. On the French Creek it is proposed to build a dam 10 feet high and 50 feet wide. The water will be carried in ditches 12 feet wide at the base, to the power house.

Much interest is being taken in the outcome of the suit brought by A. Bonslett against the Butte County Canal Company. The action involves the rights of water users to have the water for irrigation delivered on the land to be irrigated through laterals. The company claims that the contract called only for the delivery of water at the main ditch and filed a demurrer which was overruled. The canal company has not offered any testimony in support of its claims. It is supposed that the water company relies on the contract in support of the contention that it is only required to deliver water to the land to be irrigated at the nearest point on the main canal.

The Hallwood Irrigation Company, of Marysville, has let a portion of their excavation contract to the Gunn Excavating Company at ten cents per cubic yard. The work is to be commenced August 1st and completed by December 1st of this year.

H. T. Barceloux who owns a tract of land near Willows, has commenced suit against the Sacramento Irrigation Company and has secured an injunction to prevent the company from excavating or enlarging the old Central canal which runs through his land. Mr. Barceloux claims that neither the Central Irrigation District, the Central Canal and Irrigation Company or the Sacramento Valley Irrigation Company have any title to the ditch, as same reverted to the land by reason of non-use of the canal for more than five years. Mr. Barceloux is emphatic in declaring that he has no intention or desire to obstruct the progress of the irrigation company in the development of their system, providing that the company is willing to deliver water to the lands at a reasonable figure through which they pass with their canals. It is reported that the company has announced that it will not sell water to anybody, and for this reason Mr. Barceloux will start suit to protect his rights. Attorney McCahill speaking for the Sacramento Valley Irrigation Company in a recent interview stated that the attitude of the company is well known in the Sacramento valley. He refused to state whether the company would fight the case or what attitude the corporation would take. Should the case prove to be a long one and filled with delays, it will delay the work of the Sacramento Valley Irrigation Company. For the land which is tied up on the present injunction is in the district where work is contemplated, the contract having just been let to Contractor Harling. This move blocks the entrance of the canal into Colusa county, and if the injunction is made permanent, the canal will go only as far as the town of Willows.

A tract of land consisting of 18,000 acres and known as the Moulton Ranch, in Colusa county, has been sold by

the Central California Investment Company to Pasadena and Hollister capitalists. This tract of land lies just across the river from Colusa and extends from Butte Slough four miles south of Colusa to a point about ten miles north of that city. A large portion of the land has been subject to overflow during the winter months, but the purchasers have had surveys made for the purpose of determining the cost of the reclamation work and it is the intention of the new owners to start work on the reclamation of this tract at the earliest possible moment so that a large portion of the lands will be ready for colonization this coming winter.

Farmers in the vicinity of Madeline have become interested in irrigation by pumping and a well-boring outfit has been ordered to prospect for water in Secret Valley by which means a large body of fine land may be reclaimed. The Madeline Meadows Land and Irrigation Company of that city are now at work on a large project, and the building of canals and laterals has been begun.

The earth dam on the Alamo river north of Meloland is nearly completed, and water will be delivered to the Mosquito lake district in the near future. The dam will back up the waste water with the power plant in the gorge of the Alamo and will form a lake about two miles long from which water will be taken through a concrete gate for the irrigation of 16,000 acres. The wasteway is a structure of reinforced concrete and is 30 feet high. The water will flow from this structure into a basin so constructed as to constitute a water cushion that will break the force of the flow and prevent washing out of the pass by which the waste water will return to the Alamo channel below the dam.

A large tract of land comprising 100,000 acres in the vicinity of Galt will be placed under irrigation, cut up and sold in tracts suitable for small farms. The enterprise will be undertaken by the California Corporation of Sacramento. It is estimated that it will take one year to get the acreage in condition so that it may be placed upon the market.

The reservoir of the Orland project which is being constructed by the Reclamation Service and which will store water to irrigate 15,000 acres of land near Orland, was completed on July 1st. The main dam of this project is of solid concrete, 140 feet high from bedrock and 90 feet high above the surface. It is 240 feet long on the crest and 10 feet wide, with a base of 90 feet wide. The water will flow in Stony creek to a point near Orland, where a diverting dam will turn it into the main canals.

The board of directors of the Modesto irrigation district at their June meeting passed a resolution that hereafter the payment of irrigation taxes may be made in two installments. The first installment will comprise one-half of the fixed interest charge and the whole of any sum voted as a special tax; the second installment will consist of one-half of the fixed interest charge. The first installment will be delinquent after the last Monday in December and the second installment will be delinquent after the last Monday in June.

Farmers along the Merced river about seven miles from Newman have joined together and are installing a pumping plant to furnish them with water necessary to irrigate their lands.

The Consolidated Reservoir & Power Company of Los Angeles has let the contract to W. E. Pedley of Riverside to build a cement flume to irrigate lands purchased by the company near Banning. The irrigation features of the work will be completed in October, while the electric part of the work, including the power houses, will be completed shortly after that time. The flume will start from an elevation 7,000 feet in the San Bernardino mountains and will be nearly six miles long. The Consolidated Company has bought all apparent rights to Whitewater River, such as ranches that had water rights along the river. During flood seasons some of the water of this river has found way into the Coachella valley, and now that the water is to be diverted, some of the farmers in this valley have expressed alarm that their artesian flow may be affected. It is stated, however, by irrigation engineers and others who are in position to know the

facts concerning the river, that the farmers of the valley are unduly alarmed and that more water is being wasted by uncapped artesian wells in a single month than the White-water river empties into the valley in a period of five years.

A. B. Aitkin of Corning has filed on 1,000 inches of water in Mahoney creek near that city. The water will be used for stock purposes, maintaining reservoirs, irrigation and other domestic purposes.

The United States Reclamation Service is making an interesting experiment in Modoc and Siskiyou counties. It is trying to create a new outlet for Tule lake, and thereby reclaim hundreds of acres of land in northern California.

Ranchers in the vicinity of Chico are much interested in a surface pipe line irrigation system that has just been installed by G. L. Barham at his 40-acre ranch two miles from the city of Chico. Water is being pumped by means of a $7\frac{1}{2}$ horsepower engine and is forced through 5-inch steel pipes to the field. The pipe is made in ten-foot sections, arranged so that each can be stretched to any desired length, and can be made to lead in any direction. Mr. Barham has 23,000 feet of pipe and says that it is sufficient for a 75-acre field.

The Sacramento Valley Irrigation Company has let the contract for the construction of a large irrigation ditch south from Willows, into the northern part of Colusa county. Part of the work will cover the ground already covered by the old canal, but it will be enlarged to carry twice the amount of water that it now carries. The contract has been let in divisions, four contractors taking part of the construction work. The amount of dirt to be removed is 1,500,000 yards.

Residents of Rackerby have presented a petition to the board, asking the county supervisors to give them aid in arranging irrigation plans. The petitioners claim that the Feather River Irrigation Company charges \$36.56 per inch annually and will allow only 30 inches of water to each user.

The San Diego Improvement company has completed its irrigation system on the Lakeside Farms tract near Lakeside. This system has a capacity of 24 inches an hour. The company is composed of Montana men who have expended a large sum in fitting up this tract which has been divided into small farms.

The electrical machinery for operating the big gates in Laguna dam, Yuma irrigation project, is being installed. Water was run in all the canals on the reservation during May, the canals in most cases having been checked to their full height. A total of 380 acres of this land has been cleared by the settlers and six of the farmers have received water for irrigating small tracts.

Work is progressing rapidly on the siphon under the Colorado river. On the Arizona side of the river the shaft has reached a depth of 148 feet, and on the California side it is down 97 feet. All the material opposing the passage of the cutting edge has been removed by divers and the caisson is now being loaded with steel rails and cement to force its passage.

COLORADO.

Articles of incorporation of the Service Creek High Line Ditch and Reservoir Company were filed with the county clerk recently. The capital stock is placed at \$100,000 and is divided into 800 shares at a par value of \$125 each. The main office of the company will be located at Cedaredge. The incorporators are: C. S. Blanchard, R. W. Curtis, C. H. Dillon, Wm. W. Dingman and Phil Stephens, all of Cedaredge. Water will be taken from Surface Creek which is fed by a cluster of lakes situated at the top of Grand Mesa and which covers an area of nearly ten miles square. Water will also be taken from Tongue creek.

The Happy Home Reservoir & Canal Company of Montrose has filed articles of incorporation and the plat of the

company's reservoirs and ditches has been filed in the office of the state engineer. The project consists of two large reservoirs and a ditch $19\frac{1}{2}$ miles long. The estimated cost of the project is \$500,000. The reservoirs will be supplied by the waters of Dallas and Cow creeks. Both of the reservoirs are located near Ridgway, one of them covering 300 acres, the other 700 acres. Their capacity is 62,000 acre feet of water. Five thousand acres of the land is located in Ouray county and 15,000 acres in Montrose county.

At a recent meeting of the residents of northern Prowers and southern Kiowa counties, the Monmouth Irrigation district was organized. The project will embrace 120,000 acres of land in the Arkansas valley and will cost about \$4,000,000. The land to be reclaimed lies north of Hartman and Bristol and will be watered from the Monmouth reservoir and by the use of unappropriated water from the Purgatorie and Arkansas rivers.

One of the last obstacles to the success of the Colorado Southern Irrigation company's project near Pueblo has been removed by the approval of Secretary Ballinger of the Interior department to the contention of Dall DeWeese, concerning the priority rights to the flood waters of Grape creek. Several years ago Mr. DeWeese conceived the plan for this great project, and he made filings for conserving the flood waters of Grape creek. Later his rights to these waters was contested by T. C. Henry of Denver and others who sought in the United States land office in Pueblo to have the filings of DeWeese set aside as invalid on the ground of prior claims by Henry. After an investigation by the land office Mr. DeWeese's claims were approved, whereupon Mr. Henry appealed to the general land office at Washington, which approved the filings of the Pueblo land office. Mr. Henry then appealed to the secretary of the interior, who has rendered the verdict as above stated.

Under the direction of William Abbot, of La Veta, the irrigation district near that town will no doubt be brought to a successful conclusion. The proposed system will irrigate 12,200 or 15,000 acres of land.

At a meeting of the directors of the San Luis Valley Irrigation district held in Center recently, the contract for the construction of the big dam on the upper Rio Grande was let to Knowles, Ellsworth & Klaner of Salt Lake City. The figure named in the contract is \$230,000. The entire plans for the dam were submitted to the state engineer for inspection and he has returned them with his approval. Construction work will commence in the near future and the dam will be finished in the spring of 1911.

By obtaining a controlling interest in the Poudre Valley Reservoir Company, the Laramie-Poudre Irrigation Company is assured the use of the Poudre valley ditch and the litigation over this ditch has been brought to an end. The Poudre Reservoir Company brought suit a few months ago to enjoin the Greeley-Poudre district, a part of the Laramie-Poudre district, from enlarging the ditch. The Camfield interests which control the Laramie-Poudre company, have purchased 57 per cent of the stock of the reservoir company. The holdings of the reservoir company consists of about \$700,000 worth of property.

Judge Gamble of Greeley has granted a temporary injunction against State Engineer Comstock on the petition of the Lower Platte and Beaver Canal Company. The injunction states that State Engineer Comstock must permit the Lower Platte and Beaver Canal Company to divert, at its headgates in the south Platte river, the water which is discharged into the stream by two seepage ditches constructed by the company adjacent to the Empire reservoir.

Maps of the Shell Canon Irrigation and Supply canal have been filed with the county clerk. It is the intention of this company to reclaim 8,000 acres of land in the extreme northeast portion of Las Animas county. The company is backed by J. W. Fisher of La Junta and the estimated cost of improvement is \$65,000.

Judge Gamble of Greeley has granted a temporary mandatory injunction against the Bijou Ditch Company on the petition of the Green City Irrigation district. The order is of particular interest to water users in Northern Colorado, the case raising the question of whether a ditch company can disregard priority rights during a dry season, when there is insufficient water in its ditch to supply all water users. According to the injunction the Bijou Ditch Company must provide the Green City 16.32 cubic feet of water per second or as much as there are available, or carry to the district a volume of water equivalent to the amount the district has stored in the Riverside reservoir until a final hearing of the suit takes place, even though the other stockholders in the company remain without water.

Directors of the Omer Irrigation district met in Fowler early in June to perfect plans for building a mammoth reservoir for the Omer canal. A dam 60 feet high and 400 feet across the top will be constructed. The reservoir which will cover 50 acres of ground will hold 14,000 acre feet of water. As soon as the Omer district secures a settlement from the Omer Ditch Company for water rights, an election will be held to vote bonds to proceed with the plans. The project will cost about \$450,000.

The Bent County Irrigation Company has secured its 20,000 acres of land signed for and a temporary dam is under construction. Work on the main reservoir will start in the near future.

Farmers of Bent county are practicing irrigation by the use of pumps. They are also using the seepage water to irrigate their lands. C. A. Challengren and D. L. Johnck who own farms east of Las Animas have installed pumping systems and report that they have an unlimited water supply. They have a small reservoir in some seepage land on the Arkansas river, and on this they have placed a twenty-horsepower engine and a pump which pumps 1,190 gallons of water per minute.

Maps for the reservoir and ditches of the San Isidore Company have been filed with the county clerk. The land to be reclaimed comprises 3,000 acres in the vicinity of Abeyta, 25 miles south of Trinidad. Water will be taken from Rito Seco creek. It is estimated that the project will cost \$75,000.

Four of the largest irrigation companies in the west are contesting before the state land board and the department of the interior at Washington for the privilege of taking up and carrying to completion the White River irrigation project which the government abandoned because of lack of funds to complete the work. This project embraces 288,000 acres of land situated in Rio Blanco county and the cost of the canal and reservoir system is estimated at \$4,000,000. The companies who are stated as trying to gain possession of this project are: The Magenheimer Syndicate, White River and Trappers' Lake Reservoir Company, the Northwestern Canal & Reservoir Company and a fourth one represented by E. J. Kindred.

Preparations to water dry land lying north of Pierce are being made on a large scale by farmers in that vicinity. Water will be obtained by pumping, and wells with electric power are being operated.

The secretary of the interior has authorized the execution of a contract between the United States, the Uncompahgre Valley Water Users' Association and the Denver and Rio Grande Railroad Company outlining the terms and conditions upon which the United States may build a wasteway channel under the tracks of the railroad company near the outlet of Gunnison tunnel. This channel will carry water into the bed of Cedar Creek, and is necessary in case of accident to the South Canal, so that water may be cut out of the canal at that point.

IDAHO.

The Grasmere Irrigation Company has made segregation of 55,000 acres of land which has been approved by the state land board. Over 3,000 acres previously segregated for the

Owyhee Irrigation Company will be covered by the Grasmere canals. The tract to be irrigated is located in Owyhee county about 90 miles south of Boise and 65 miles from Mountain Home. Water will be taken from Sheep and Mary's creek. The aggregate filing of the various permits held by the company is 1,525 cubic feet per second. Among the streams covered by these filings are: Nannie creek, Wickahoney creek, Pinkston creek, Snow creek, Bull creek and Rattlesnake creek, China creek, Crab creek. The estimated cost of the project is \$1,000,000. The enterprise is backed by Seattle, Spokane and Tacoma capitalists. Following are the officers of the company: C. B. Haraden, of Seattle, president; J. M. Hawthorne, of Seattle, secretary; John Hampshire, of Tacoma, treasurer; Albert Daub and U. M. Dickey, of Seattle, and John W. Twohy, of Spokane.

The machinery for the pumping plant of the Payette Heights Irrigation Company has been installed, which will force water from the lower Payette ditch up the hillside 133 feet to the intake of the High Line ditch which will supply water to 4,000 acres of fruit land adjoining the city of Payette.

Work on Snake River Irrigation Company's project which will reclaim 14,000 acres of land on the Dead Ox flat is progressing rapidly. The company has its office in Payette. Mr. E. M. Housh of that company in a recent interview stated that they expected to have their pumping plant installed some time in September. He also stated that the pumping plant will be located on their own land near the Applegate ranch.

The Crane Creek irrigation project which will place under cultivation 22,000 acres of land in the vicinity of Weiser, had a land opening and sale on June 14th. A contract has been let to the Slick construction company for the construction of the dam, ditches and laterals of the company. The contract price is \$950,000. Water is to be on the land by May 1st, 1911. The dam will form an artificial lake about five miles long by four miles wide with an average depth of 25 feet and will impound more than 70,000 acre feet of water. The dam will be constructed fifteen miles from Weiser. It is on the south side of the Weiser river and as about half of the land to be covered is on the north side of the river the water will be syphoned across the river at a point about ten miles from that city.

The Darlington, Taylor and Rodgers ranches, situated on the Big Lost river in Blaine and Custer counties were sold recently to a company of eastern capitalists for \$200,000. The combined area of these ranches is 5,500 acres. The purchasers will incorporate as the Darlington Land and Irrigation Company, and will sell their holdings in 40 and 60 acre tracts. The office of the company is located at Hailey.

The Blackfoot North Side Irrigation Company of Blackfoot will place on the market in the near future 35,000 acres of choice land which can be taken up under the Carey act. The company is now at work surveying the land and the engineers are running the lines for the canals and irrigation ditches. The land is tributary to the new town of Pingree and will be traversed by the new branch railroad that is being built from Moreland.

Contracts have been executed with the Oregon Short Line Railroad Company by which the company grants to the United States the right to cross the right of way and pass underneath the tracks and roadbed of the railroad company with various canals near the town of Burley on the Minidoka irrigation project in southern Idaho. Negotiations are being made for the acquisition of right of way for canals and laterals through deeded land.

The Reclamation Service has been conducting an interesting experiment on the Minidoka irrigation project in Idaho, to drain small bodies of land which have been submerged as the result of irrigation. At one point a lake covering about 80 acres had formed. A well was sunk near the lake to a depth of 100 feet, the last 30 feet penetrating the lava rock which underlies the whole project. A six-inch

casing was put in to the top of the rock and the waters of the lake were directed into the well. For the past month the water has been drained into the well at a rate varying from one to three second-feet, or an average flow of more than a million gallons per day. Should other wells prove equally effective it is believed the problem of drainage on this project can be solved without the necessity of constructing long and expensive drain ditches to carry the surplus water to the river.

Water for irrigation was delivered throughout the Minidoka project, Idaho, during May. Excavations on the North Side Waste Water system were continued and preparations are being made for the erection of a second excavating machine. Two crews are working in wet material not included in contract work. Structures for the South Side Pumping Unit are being erected and machinery is being installed at the power station.

During the month of April the farmers under this project paid water right charges to the amount of \$56,318.73.

The secretary of the interior has issued the following public notice for the Minidoka irrigation project, Idaho:

"Certain sublaterals are not being maintained in proper condition by the district organization with the result that some of the lands entitled to water cannot be properly irrigated.

"In order to maintain the efficiency of the sublaterals so that all lands entitled to water may receive an adequate supply, notice is hereby given that in any case where such ditches are not maintained in a proper condition or state of repair by the water users, the necessary work will be done and materials and supplies purchased by the United States to put the said ditches in proper condition.

"The cost of all such work, materials and supplies will be charged equitably against the land benefited thereby, as part of the installment of the charges under the Reclamation act. The charges therefor shall become due on December 1st of the year in which the work is done and no water shall be furnished in any subsequent year for any tract until all such charges against the same shall have been paid."

MONTANA.

Articles of incorporation have been filed by the Homestead Land and Irrigation Company with headquarters at Virginia City. It is the purpose of this company to reclaim a tract of land between the Beaverhead and Ruby rivers, southwest of Virginia City. The dam will be 150 feet in height. The canal will follow the west side of the Ruby canal under the base of the Ruby Mountains and reach the bench land point almost directly opposite the city of Sheridan. The land will be reclaimed under the provision of the Carey act and it will perhaps be a couple of years before the land is thrown open for settlement.

Engineers of the Reclamation department of the government are making surveys for the necessary extensions of the main canal of the Huntley project for a distance of ten miles towards Pompey's Pillar, and for a distributing system, also for an extension and distributing system at the High line canal which is operated by a pumping plant in the Fly creek country east of Ballantine. A reservoir will be constructed and a large area brought under irrigation. In a recent interview H. N. Savage, chief engineer of the Reclamation department, stated that the new tract will be open to settlement under the same regulations as was the main part of the Huntley project, but that the units will be 80 acres in size with many of them a full quarter section, and 40 acres and upwards of each will be irrigated.

The government's large project in the Milk river country is being handled in sections and work on the first part of 9,000 acres is practically completed. This tract extends between Dodson and Malta, on the south side of Milk river.

Pittsburg capitalists have purchased 4,000 acres of land near Hamilton, in the Bitter Root Valley. According to present plans this land will be cut up into 10 acre orchards.

NEW MEXICO.

Work on the Orchard Irrigation Company's project near Farmington in San Juan county will be commenced in the near future. The district includes all of the territory between Aztec and the La Plata north of the Independent or other ditches, and under the proposed Illinois ditch. The project embraces 14,000 acres of land. The work is to be completed February 1st, 1911. The Standard Construction Company have been given a contract to build a canal forty miles long.

A petition for the irrigation of the Canadian Valley irrigation district around Logan is being circulated and is being well received by the farmers in that vicinity.

Plans for the Portales pumping irrigation plant in Roosevelt county have been filed with Territorial Engineer Vernon L. Sullivan. The project appears to be a very feasible one. The headquarters of the company are at Portales.

OREGON.

Plans are under way to develop an irrigation project in the Little Klickitat River Valley near Goldendale. The project involves the construction of a large dam across the river at a point some distance above Goldendale.

The United States has brought action against Fred A. Yates, Florence C. Yates, Elmer P. Dodd and Leroy W. Furnas, to compel them to permit government engineers to proceed with the work on the Umatilla irrigation project. Yates and his wife own a farm near Hermiston, and they are resisting the cutting of government irrigation canals through their land. This canal is to supply 10,000 acres with water. Yates and others obtained temporary injunctions against the government's proceeding in the state court and now the government has been granted an injunction restraining the Yates family and others from interfering with their work. The Umatilla project is intended to supply 25,000 acres of land with water, and is about 87 per cent completed. More than \$1,000,000 has already been expended upon it. The Umatilla river is rapidly falling and the reclamation engineers state that unless they are permitted to complete the dam immediately thousands of dollars worth of work will be ruined and the project injured irreparably.

By boring wells to a great depth on the east side of the Paulina mountains, now a part of the Deschutes National Forest, and excavating surface wells on the west slope, it is intended to make 260,000 acres of land in the Paulina mountains available for settlement. The district to be irrigated is known as the lava beds and lies from 40 to 50 miles west of Prineville. Owing to the porous character of the soil and rock, water is not long retained in the surface depressions and while there is a rank growth of vegetation and forest growth, it has been impossible for stockmen to make use of the territory. It is stated to be capable of supporting 65,000 head of sheep.

Three hundred men are employed on the Oregon Land Company's irrigation canals in Drew's creek canyon, near Lakeview. Work is to be started on the big flume in the near future. Work has reached such a stage that part of the crew is to be transferred to the south canal, which will be 12 miles in length, with an average width of 15 feet on the bottom.

J. H. Gray & Son, who have a large ranch near Prineville are constructing an irrigation system that will reclaim 500 acres of land.

W. F. King, J. O. Powell and Herman Poch are building a canal to irrigate 1,000 acres of land in the vicinity of Prineville. This land will be planted to orchards.

Some 15,000 acres of land in Gilliam county on Rock creek, are to be irrigated by constructing a dam and storing water.

(Continued on page 467.)

Supreme Court Decisions

Irrigation Cases

RIGHTS OF OWNERS.

The most that ditch owners are entitled to claim at any time is that the amounts to which they are respectively entitled shall flow to the head gates of their ditches.—*Kelly v. Hynes*. Supreme court of Montana. 108 Pacific 785.

EFFECT OF NOTICE TO STATE ENGINEER.

An application to the state engineer for permission to appropriate public water is merely notice of intent to appropriate, and does not establish an appropriation.—*Sowards v. Meagher*. Supreme Court of Utah. 108 Pacific 1112.

RIPIARIAN RIGHTS.

An upper riparian owner may not impound all the waters flowing in a stream for 14 hours out of every 24,

has a primary right to the full flow of the stream at flood in order to bring his stratum up to its water-bearing capacity, though not to the extent that they may replenish his water-bearing stratum, as against the right of an appropriator to divert any part of the waters for commercial use beyond the watershed.—*Miller v. Bay Cities Water Co.* Supreme Court of California. 107 Pacific 115.

ERECTION OF DAM.

The owners of the right to maintain a dam have no right to rebuild and maintain a new dam in such a way as to place a greater servitude or burden on the property of other riparian owners than had been put upon it by the maintenance of the previous dam.—*Greeley Irr. Co. v. Von Trotha*. Supreme Court of Colorado. 108 Pacific 985.

TRESPASSERS MAY ACQUIRE WATER RIGHTS.

Trespassers upon land may acquire the exclusive right to the use of water either to irrigate land or for other purposes, and, when such right is acquired, it is paramount to the rights of the true owner or claimant of land, and the water claimant, when he is dispossessed of the land, may divert and use the water elsewhere, if he can so di-



This illustration shows two Flour City Tractors manufactured by Kinnard-Haines Company of Minneapolis, Minnesota. These outfits are owned and operated by Wakefield Bros., at Mott, North Dakota. They are hauling two gangs of 8-14-inch breaker bottoms and have a capacity in raw sod of from 20 to 30 acres per day each. See advertisement on page 456.

without the consent of a lower riparian owner or a condemnation of his rights.—*Tacoma Eastern R. Co. v. Smithgall*. Supreme Court of Washington. 108 Pacific 1091.

FLOW FROM RESERVOIRS.

So long as the required volume of water is maintained at the heads of irrigating ditches of parties entitled to water, other parties damming sources of the supply need not permit any flow from their reservoirs, whether it consists of the natural outflow or of the conserved flood water.—*Kelly v. Hynes*. Supreme Court of Montana. 108 Pacific 785.

JUNIOR APPROPRIATORS OF WATER.

When a junior appropriator makes his appropriation, he acquires a vested right in the conditions then prevailing upon the stream and surrounding the general method of use of water therefrom, and he may assume that these are fixed conditions, and will remain without substantial change, unless a proposed change will not work harm to his vested rights.—*Vogel v. Minnesota Canal & Reservoir Co.* Supreme Court of Colorado. 107 Pacific 1108.

UNDERGROUND WATER-BEARING STRATUM.

The owner of land having an underground water-bearing stratum supplied by the flood waters of a stream

vert and use it.—*Patterson v. Ryan*. Supreme Court of Utah. 108 Pacific 1118.

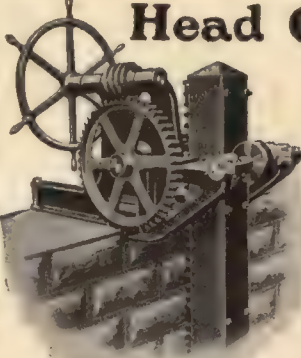
SPRINGS.

Though one may have riparian rights in a stream, though its source is but a spring on the land of another, it must be a stream that was wont to flow from time immemorial, and the owner of land on which a new spring breaks out may make such use of the waters as he pleases, though the waters, if unmolested, would cause a stream to flow across another's land.—*Mason v. Yearwood*. Supreme Court of Washington. 108 Pacific 608.

DAMAGES TO CROP.

As land prepared for alfalfa will produce several crops each year for several years without further care, except in the way of irrigation, the measure of damages of one who just after preparing his land for alfalfa, and cutting the first crop, was wrongfully denied water for irrigation by a water company, whereby he lost the two additional crops, which, with irrigation, the land would have produced that year, and a reseeding was necessary, is the value of the two crops lost, less cost of irrigation and cutting, plus cost of reseeding.—*Lowe v. Yolo County Consol. Water Co.* Supreme Court of California. 108 Pacific 297.

(Continued on page 481.)



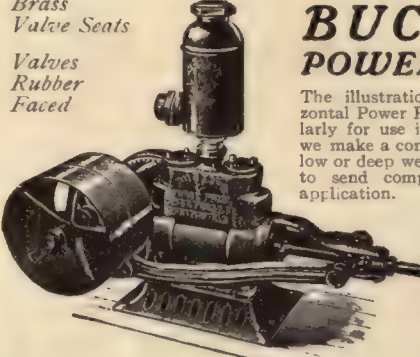
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Write today.

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(Continued from page 454)

and agent for me and in my name, place and stead, to make application to the State Board of Land Commissioners of the State of Idaho, for the entry of land under the provisions of the Act of the Legislature of the State of Idaho, approved March 2, 1899, entitled "An Act to Provide for a State Engineer, Defining His Duties and Regulating His Compensation," etc., and to receive from the said State Land Board the certificate of such entry, as required by its rules and regulations; also to make all contracts and do all things necessary in the purchase of a water right for said lands. The land so to be entered by my said agent is situated in the County of....., State of Idaho.

Hereby giving and granting unto my said attorney and agent full power and authority to do and perform all and every act and thing whatsoever requisite and necessary to be done in and about the premises as fully to all intents and purposes as I might or could do if personally present, hereby ratifying and confirming all that my said attorney and agent shall lawfully do or cause to be done by virtue of these presents.

In Witness Whereof, I have hereunto set my hand and seal the.....day of....., A. D. 190..
Signed, sealed and delivered in the presence of.....Seal.

State of } ss.
County of }

On this.....day of....., in the year of our Lord one thousand nine hundred and.....before me....., a Notary Public in and for said County and State, personally appeared..... known to me to be the person whose name is subscribed to the within instrument, and duly acknowledged to me that he executed the same.

Notary Public.

My commission expires.....

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(Continued from page 464.)

The Kingman Colony Irrigation district has been organized with headquarters at Ontario, Oregon. The district comprises 17,000 acres of land which will be irrigated from the Owyhee River High Line project, which will cover in all 135,000 acres of land, included in the Gem Irrigation district in Idaho, and the Owyhee Irrigation district in Oregon.

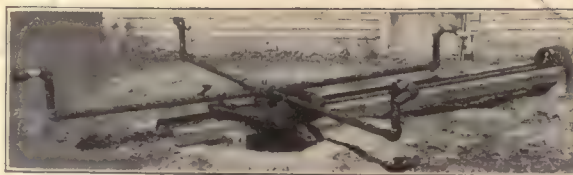
John Arzner of Myrtle Creek has bought a 2,000 gallon galvanized tank and windmill and will install an irrigation system.

Colonel John F. Spray of Cottage Grove has purchased 400 acres of bottom land in the Row river valley, and is constructing an irrigating ditch a distance of three miles to water the land, which will be set out in orchards and sold in five and ten-acre tracts. Not more than ten acres will be sold to any individual.

The directors of the Owyhee Irrigation District met at Nyssa recently and elected C. C. Hunt president and W. Lee Blodgett secretary.

C. E. Monro of Seattle, Wash., has purchased a large tract of land in Wheeler county, Oregon, for a consideration of \$125,000. This property consists of the finest irrigated and grazing land on Bridge creek and is one of the largest individual tracts in this district.

The state land board has posted notices that forfeiture proceedings are to be commenced against the Deschutes Irrigation and Power Company for the non-fulfillment of the terms of the contract with the state. A petition of Receiver Redfield to the court has been granted which authorizes that official to negotiate with the state land board in the endeavor to have that body defer its contemplated action of forfeiture. About 13,000 acres have been sold on contract and approximately 12,000 more are said to be ready for water. About 200,000 acres have been segregated and completion of the whole tract will



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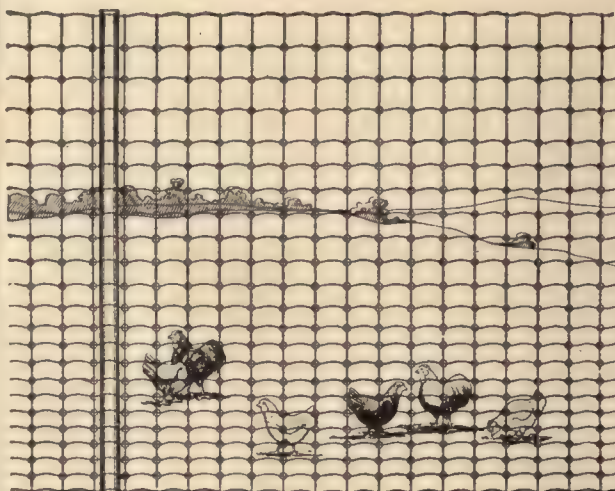
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be necessary to return to the land holders their money. Forfeiture now would prove a stupendous loss to the investors, while not affecting the farmers, who have already purchased. The only asset of the reclamation company is an equity which will materialize if certain work is finished. Forfeiture proceedings will stop all new work and leave the receiver to administer a property as he found it. Such a course in reclamation projects violates the provision of the state laws and opens the work to forfeiture.

R. R. Lewis and associates of Pendleton, Oregon, have secured possession of the Furnas tract lying half within and half without the city of Hermiston. The consideration was \$56,000. Mr. Lewis states that one Portland and several Pendleton men are interested with him in the project and that they intend to subdivide the land into acreage tracts from one to ten acres.

John E. Spray, who owns a large tract of land two miles east of Cottage Grove, is digging an irrigation ditch two and one-half miles long from Mendall Falls, with which to water 1,000 acres of land. Water will be taken from Row river. The cost of the work will be about \$5,000.

It is reported that the Keno lands have been released from the Klamath project and the landowners in that vicinity will pay for the construction of a power plant. The construction of the Keno ditch was undertaken by the government and later abandoned because of insufficient funds.

UTAH.

State Engineer Caleb Tanner has set aside a part of the Provo river and Jordan river country as an irrigation system under the name of the Utah Lake & Jordan River Irrigation System.

Articles of incorporation of the Little Missouri Irrigation Company were filed with the county clerk at Ogden recently. The company is composed of farmers in the vicinity of Pleasant View who will handle the general irrigation plans under way there. It will take over a number of pipe lines and irrigation ditches and will undertake the extension of the irrigation system throughout the northern part of the country. The capitalization is placed at \$9,000, with shares at \$5 each. The officers are: C. E. Storey, president; George Sanders, vice-president; Wilson Cragun, secretary and treasurer.

Annie G. Lauritzen of St. George filed a petition with State Engineer Caleb Turner to use the water of Oak Springs, Washington county, for the purpose of irrigating 160 acres of land.

The Uintah Irrigation project, built by the United States government for the Indians of the Uintah tribe in northeastern Utah is practically completed. This project will bring 100,000 acres of land under ditch. The country is being rapidly settled and the government is making important improvements within the reservation. When the government threw open to entry two-thirds of the reservation five years ago, it allotted one-third to the Indians. As additional compensation for the loss of the larger portion of their land the government promised to irrigate the section allotted to the Indians. The Indians to whom the land has been allotted are not permitted to sell, but upon their deaths the heirs may sell.

Snell Johnson of Vernal has filed a petition with the state engineer to use waters of Burch springs, Uintah county, for the purpose of watering five acres of land.

Ira W. Hatch of Panguitch, Garfield county, has filed an application with the state engineer for the appropriation of one cubic foot of water per second from Rock Canyon Springs, for irrigation purposes.

Doran, Lungburg & Wilson have withdrawn the injunction restraining the Mutual Irrigation Company from forming an irrigation district. The difficulty was settled outside of court and both companies came to an agreement to support the forming of a new district, which means that a \$100,000 dam will be put across the river before fall.

The irrigation companies interested in the lakes at the head of Provo river which have been appropriated for reservoir purposes have applied to the state land board for a \$50,000 loan with which to perfect the work of reservoiring the lakes and the amount has been practically granted. A large amount of money has already been expended on this project in building canals in the valley to convey the water on to the lands to be irrigated and it is expected that at least \$250,000 will be used before the work is completed.

It is stated by government officials that work on the Price River Irrigation project lying south of the thriving town of Price, will be completed by November first of this year. The approximate cost of the canals and reservoirs to irrigate this tract will exceed \$500,000. Water is diverted from the Price river by means of a large dam midway between Helper and Price. The water is carried twenty-one miles to the land which is to be reclaimed. The land will be thrown open to entry under the Carey Act on October first.

WASHINGTON.

Five business men of Chesaw have purchased the Chesaw Indian allotment comprising eighty acres of land adjoining the townsite of Chesaw. It is planned to plat the tract and put it on the market.

It is reported that the Electric Bond and Shares Company of New York, a subsidiary company of the General Electric Company, has secured an option on the holdings of the Hanford Irrigation and Power Company of Seattle. The Hanford company owns and controls water rights on the Columbia river at Priest Rapids sufficient to generate 100,000 horsepower, in addition to about 30,000 acres of land.

The town of Mabton has had an irrigation district surveyed and has advertised for bids for the construction of canals and flumes within the city limits.

Announcement has been made by the Pasco Reclamation Company of Pasco that everything is in readiness for starting the pumps as soon as the pumping cables have been stretched across the river. The pumps will then be connected and water will flow through the entire system of irrigation works.

The Tieton irrigation project was formally opened on June 8th. More than 30,000 acres extending back about 15 miles up the Tieton in the vicinity of North Yakima will be made productive by the Tieton ditch. The project is considered one of the greatest engineering feats undertaken by the federal reclamation service. For miles the canal, of concrete, steel reinforced, is hung on the perpendicular walls of the Tieton canyon. It pierces a mountain of solid rock for a distance of two miles. Three main laterals, in large part concrete lined, will convey water for the irrigation of the lands under the three units of the Tieton project. It is estimated that the cost of the project is something over \$2,000,000.

Actual work on the Wapato irrigation project near Chelan was started on June 21st.

An irrigation project which may involve the expenditure of from \$1,000,000 to \$1,500,000 and result in the bringing of water to 60,000 acres of land in Adams county is practically assured. W. R. Brown, H. F. Fellows and R. M. McMurray of Spokane are interested in the enterprise, working under the name of the Keystone Irrigation Company. The proposition is to take water from the lower end of Lake Colville and carry it by ditch or flume in the direction of Ritzville, 15 miles distant.

A counter petition to the one recently filed against the organization and operation of the Yakima Highland Irrigation & Land Company by residents of the Wenatchee valley, to water 7,000 acres has been filed with Engineer C. H. Swigart of the reclamation service by other residents of the valley.

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RICH in high grade coal veins from six to thirty feet thick, now being developed in all parts of the State. **RICH** in high grade oil and natural gas now being developed at Byron and Greybull. Natural gas piped to Greybull and Basin City; new oil refinery at Cowley. **RICH** in high grade iron ore, so accessible that trains are loaded with steam shovel, direct from the mines. **RICH** in copper, gold, silver, lead, mica, sulphur, and asphalt that is now attracting capital from all parts of the world. **RICH** in timber, stone and cement material, for building purposes; in water power for factories; in hunting and fishing for the sportsman; in beautiful scenery, unsurpassed in any country.

Rich in Opportunity for the Farmer

In the midst of these great natural resources, you can take a homestead irrigated by the Government, paying actual cost of water in ten yearly payments without interest, or buy irrigated land from the State under the Carey Act on long time payments, only 30 days' residence required; or buy deeded irrigated farms at reasonable prices; or you can take a 320-acre free homestead under the Mondell Act, where Dry Farming is already successful.

GET CLOSE TO A NEW TOWN AND THE NEW RAILROAD

You can do this here, for the Burlington Route is building a new main line right through the Big Horn Basin, the heart of this richest undeveloped country in the West, with new towns springing up like magic every few miles. This means splendid transportation facilities, fine business openings in the towns and big future values to these farms. History is sure to repeat itself and these farms that may now be had for a mere trifle of their actual value will soon make their future owners rich. No one—farmer, merchant or investor—looking for home or investment, can afford to overlook the grand opportunities of this new country.

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Specially Prepared Literature describing the various resources of Wyoming, sent free. Write or fill out and mail attached Coupon. Do it today.

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Bureau, 187 Q Building
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The Robert Strahorn Irrigation & Power Company has purchased the shore lands on the Columbia river near Priest Rapids for a consideration of \$10,000. The price agreed upon is \$15,000 less than the value fixed upon the property by the state land board some time ago. The company protested the original appraisement of \$25,000 and at a recent meeting in Seattle of tax commissioners and the state forester it was agreed that the protest was well taken and that the state should not ask more than \$10,000.

The Upper Columbia Company has undertaken one of the most gigantic irrigation projects ever attempted in the state of Washington, just north of Bossburg on the Columbia. The parties who are backing this company are unknown. Water will be taken from the Columbia river, also from the Kettle river and its tributaries. Work has commenced on the fifteen-mile creek dam and flume and the contract calls for the completion of the work by June 1, 1911.

The Wapato Irrigation Company has awarded contracts for ditch work on its irrigation project to water 1,000 acres of land in Lake Chelan valley in central Washington. The two contracts represent an expenditure of \$10,000 and work will begin at once. The ditch to be constructed under these contracts will be completed.

Directors of the Tieton Water Users' Association, headed by A. J. Splawn, former state senator, which will eventually control the irrigation canal under construction by the United States reclamation service in the Yakima valley, have voted to increase the capital stock of that corporation from \$1,000,000 to \$1,440,000. This step was necessary owing to the increase of acreage under the canal and the additional cost of construction.

Klickitat Irrigation and Power Company have filed maps and descriptions with the Yakima land office for the big irrigation canal to be run from the head waters of the Big Klickitat river to the Horse Heaven country in south central Washington. Details for construction have been completed for forty-two miles of the canal, which will be 110 miles in length. The drainage area is 175,000 acres, of which 93,000 acres is in the Yakima reservation and 82,900 in the Mount Rainier forest reserve. The intake of the canal will be north of the mouth of Pearl creek, on the main Klickitat river, where the storage dam will be constructed. It is proposed to maintain a flow of 1,250 cubic feet of water per second the year round.

WYOMING.

The Saratoga Valley Land & Irrigation Company recently incorporated under the laws of Wyoming, has taken possession of the ranch property known as the W. B. Hugus ranch near Saratoga. These holdings comprise nearly 1,500 acres of land with one of the oldest water rights out of the North Platte river. The company intends to cut the tract up into small holdings of from 20 to 40 acres, bringing in settlers to either purchase or lease the ground. The main office of the Saratoga Valley Land & Irrigation Company is located at 633 Seventeenth street, Denver, Colorado.

It is stated that an immense irrigation project is to be undertaken in Carbon county. The proposition is to construct an irrigation canal starting just below Baggott rocks, taking water from the North Platte and Encampment rivers and extending some 60 miles north to Rawlins. This would irrigate and make productive 125,000 acres of sage brush land. A preliminary survey has been made by Engineer R. Z. McCoy of Encampment, who states that the proposition is entirely feasible.

Officials of the North Laramie Land and Irrigation Company have turned water into the large irrigating plant that they have been constructing for the past two years. The main canal which is 14 miles long has been completed. The project has several thousand acres that will be colonized. The land is in the northern part of Laramie county.

The Shoshone dam, which forms the most important feature of the largest irrigation project in Wyoming, has been

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completed. The dam is of concrete and measures 328.4 feet from foundation to the crest. It is 175 feet long at the top and 85 feet long at the bottom. The reservoir back of the dam has a capacity of 456,000 feet and will serve to irrigate 130,000 acres of land situated about 75 miles east of the Yellowstone National Park.

MISCELLANEOUS.

It is reported that Denver men and money are behind a \$1,000,000 reclamation and irrigation project which will reclaim 100,000 acres of land in the vicinity of Holbrook, Arizona, on the line of the Santa Fe. The land lies along the Little Colorado river. It will require an expenditure of \$1,500,000 to complete the project. Among the men interested are Charles A. Stokes, J. H. Sherman and A. M. Patten of Denver and D. J. Meyers of Boulder.

The Swenson Land Company of Chicago, operating the Toyah valley in Texas, has closed negotiations with eastern capitalists which will enable them to further develop the property. A large reservoir will be built which will bring 6,500 acres of land under irrigation, and this supply, in addition to the other plans for conservation of storm water, will make the total acreage in the valley under irrigation over 25,000 acres.

Superintendent Rastall, of the government Indian school at Pierre, South Dakota, has been experimenting with artesian water for irrigation. Mr. Rastall had no practical knowledge of the use of water and has simply tried this as an experiment. He has, however, this season secured the services of a couple of Idaho men who are skilled in the use of water on irrigated farms and who will this summer make a practical test of that class of work at the school. If the work proves a success, it will mean a large extension of the irrigated farming in South Dakota. The lands will be watched with more than local interest, as the question of practical use of artesian water for irrigation in the state of South Dakota has been discussed from both sides for years. It has never been put to a practical test by men who were thoroughly familiar with that manner of farming.

The Florida Irrigated Farm Company of Astor, Florida, has acquired title to 125 acres of land near the town of Astor and will begin clearing and improving it at once.

A tract of land near Waycross, Georgia, comprising 140,000 acres, has been sold to western investors for development purposes, at a reported consideration of \$700,000.

At a meeting of the executive committee of the Texas Irrigation Company, held at Fort Worth, Texas, the last week in June, a committee was selected to which was referred the work of examining and codifying the laws of Texas relating to irrigation. The committee elected M. L. Swinehart of Pecos, Texas, president of the Congress; Chenault O'Brien of Beaumont, Ben Campbell of Houston and Henry Clossner of Chapin.

At a recent meeting of agriculturists held at Mickleton, New Jersey, much interest was displayed in the subject of irrigation. Two of the most prominent agriculturists at Gloucester county board of agriculture advocated the installing of irrigation systems.

It is reported that Rapid City, South Dakota, parties are planning a large private irrigation scheme by which it is hoped to put water on 57,000 acres of land west of Rapid City between the land of the Northwestern and the Milwaukee railroads. The plan involves the building of a lake between Owanka and Creston, the lake to be three miles long and one and a half wide and thirty feet deep. The Corbin Morse ditch is to be extended to empty into the lake, which is to act as a reservoir for the tracts of land that can be made highly productive with irrigation.

The Gulf Coast Irrigation Company of Lyford, Texas, has purchased a large acreage on the west side of that town.

W. L. Church, an engineer employed by the Amburson Hydraulic Company of New York and Boston visited Phoenix, Arizona, lately for the purpose of visiting the Frog Tank irrigation project, of which W. H. Beardsley is the promoter. The Amburson company are builders of reinforced concrete dams for irrigation work and it is their purpose to furnish estimates on the cost of a dam for this project.

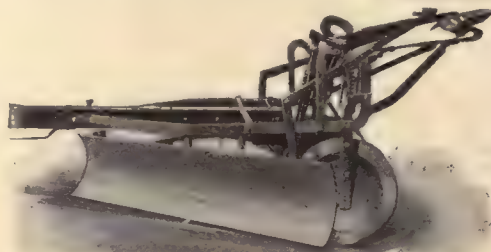
Clean Laterals

An Irrigation Farmer in Colorado says:—

"This spring my laterals were full of thistles and trash, so we could not run the plow, as they would gather under the beam and put the plow out. As I was passing one of these ditches with the 20th Century Grader, thought we would try, but did not think we could do anything with it until we had taken the trash out. Well, once up and once back, and I had the prettiest ditch you ever saw. Took out the trash and everything and left the ditch clean.

"We loaned our 20th Century Grader to a neighbor at \$1.00 a day. When he returned it he paid us double the price, as he said he made more and better ditches in three days than he could make in a month with scrapers."

A. J. NORDLOH.

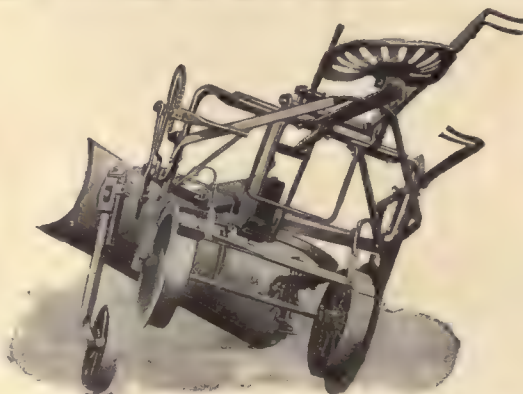


Blade reversed for grading

We'll challenge you to find a machine to equal it for irrigation farmers—useful in a dozen ways the year around. Use it to grub brush first; next, level land; then ditch and make laterals; then throw dikes, grade roads, move dirt—anywhere, anyway. One man, four horses easily handle the

Irrigation 20th Century Grader Machine

It's almost unbreakable because made of steel. Weighs but 600 pounds. 6-foot moldboard, flanged wheels. Transport it anywhere. No wonder irrigation farmers are enthusiastic over it. It's a great time and money saver—not for a few days, but for 12 months! Send for free catalogue and a fistful of testimonials.



20th Century Irrigation Machine tilted for lateral cutting or cleaning

THE BAKER MANUFACTURING COMPANY
726 Fisher Building, CHICAGO

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No. 3. Traction Gasoline Machine crossing the high Sierras of Eastern Washington, where fuel and water are not to be had. We made the 25 mile move in 8 hours, using 20 gallons of gasoline at 19c per gal. We had no team nor needed any. The one in the picture did not belong to the machine.

THE DESERT DRILL

This is a Standard KEYSTONE Traction Cable Drill, driven by a two cylinder double opposed gasoline engine. Size 3 has a 22 H. P. engine and is guaranteed for 500 ft. depths. Size 5 has a 30 H. P. engine and is guaranteed for 1000 ft. with manilla cable or 1500 ft. with wire line.

Requires no fuel but gasoline.

Requires no water except for cooling engine and a little for the hole.

Will go anywhere on its own power.

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KEYSTONE MOTOR DRILL WORKS

Beaver Falls, Pa.

No. 3 Traction Gasoline Drilling in Eastern Washington, using 500 ft. of 2 1/4 in. cable and cutting 10 in. hole. Has 28 ft. string of tools with 3 1/4 x 22 ft. stem. This drilling was all hard basalt boulders and our best day's work was 50 ft., using 15 gal. of distillate at 13 cents per gallon.



The charter of the Pecos and Toyah Lake Irrigation Company of Pecos, Texas, has been filed with the secretary of state. Capital stock of this company is \$1,500,000. J. N. Levin of Rutherford, R. S. Johnson and T. H. Beauchamp of Pecos are the incorporators.

The Queen Creek dry farming colony has organized a company to put in a large pumping plant on the Gila river between Florence and Pima reservation, to pump irrigating water to their lands. They will sink wells on the bank of the stream out of reach of high water, and connect them up to large pumps in units of two wells to one pump.

A large tract of marsh land owned by Mr. Armond Capon near Grand Chenier is to be reclaimed. The irrigation ditches have all been dredged and the water has been drained off. The land will be in shape for colonization by fall. It is Mr. Capon's intention to go to Belgium, where he expects to form a colony to emigrate about the first of October and begin the cultivation of these reclaimed lands.

Work on the Nazas river dam, which will be constructed near Caja Pinto, Mexico, has been commenced. The dam, when it is completed, will have a storage capacity of 1,800,000,000 cubic meters of water. It is planned to hold sufficient water to more than irrigate the entire Laguna district and enable the planters to double the yield of cotton per acre.

Peter Winkelman and son of Winkelman have ordered a windmill, pump and tank for use on their ranch near Florence, Arizona. He will install several twelve-inch wells on his Halfway ranch, which is underlaid at a depth of thirty feet by strong water stratum.

Dr. N. J. Phenix has recently installed an irrigation plant on his truck farm near Colorado, Texas. Water is pumped out of the Colorado river and conveyed to the ditches by means of pipes. This is the largest outfit of the kind in Mitchell county and the success of the undertaking is being watched very closely.

I. H. Kempner and associates of Galveston, Texas, have purchased the water works and irrigation rights at Alamogordo, New Mexico. A sum of \$180,000 was paid for the rights.

H. L. Chaffee of Cameron, Wisconsin, has installed a small pumping plant with which to irrigate his strawberry patch. Mr. Chaffee states that his berry crop has suffered by drouth each year, just at the time of ripening and he has installed this plant simply as an experiment.

J. W. Longstreet, an irrigation expert, has been employed to make investigations along the Saline and Smoky Hill rivers near Manhattan, Kansas, as to the possibility of irrigation, and he reports that there are many favorable locations for individual farm systems.

Frank Field, secretary of the state board of agriculture and ex-officio state engineer of Guthrie, Oklahoma, has approved the application of S. B. Laune of Woodward, Oklahoma, to take water from Sand creek to irrigate sections.

The Cimarron Valley Irrigation Company, of Lamar, Colo., has contested the right of J. A. Martin Ford of Garrett, Oklahoma, to rights in the Cimarron river. Mr. Ford has never perfected his rights as a water user, although his application has been on file for some time. It is now being opposed as above stated by the Cimarron Irrigation Company, which has planned a large irrigation scheme in the Panhandle country.

C. A. Armstrong of Fargo, Oklahoma, has filed a petition with the secretary of the state board at Guthrie, Oklahoma, for the water from Boggy creek in Ellis county, with which to irrigate eighty acres of land.

A meeting has been planned to be held at San Benito, Texas, in the near future for the purpose of perfecting the organization to be known as the Lower Rio Grande Valley Association. The purposed organization is to be composed of the leading land and irrigation propositions located in the valley for the purpose of advertising the advantages of that district. The association is to be incorporated and a competent secretary will be placed in charge.

In the district court at Barstow, Tex., Judge Isaacs sustained the foreclosure proceedings against the Grand Falls Mutual Irrigation Company. A. Thompson of Los Angeles and A. Z. Monell, president and manager of the company, and L. A. Rodes of Sedalia, Mo., representing the bondholders, were in court when the decision was rendered. This places the management and control of the

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company in the hands of the bondholders and the policy of the new management will be watched with interest, especially by the water users under the system, who have been at variance with the former company for some time. The irrigators refused to pay the annual water rentals at the opening of the fiscal year, claiming that they had not been furnished with sufficient water for irrigation, whereupon the company refused to deliver water and the canals were dry. The bondholders, fearing financial loss would result, ordered water turned into the canals, and the present suit is a result of this controversy.

A test case brought in the district court at Garden City, Kansas, recently by the sugar beet growers, for the purpose of forcing the Garden City Sugar Beet Company, which owns an irrigation ditch, to furnish sufficient water to the farmers, was decided in favor of the beet growers. Robert Warthen claims that he took up sugar growing at the instigation of the sugar company and that it had tacitly agreed to provide water at a given cost. It did this for a time, but lately had refused to do so and sought to evade its contract. The decision of the district court will be appealed to the supreme court, as the sugar company seems to be facing the same failure that the decision has shifted from the farmers.

More than \$2,000,000 will be expended by Chicago capitalists in the reclamation of swamp lands about twenty miles from New Orleans. Reynolds, Watson & Company of 317 La Salle street, Chicago, Illinois, have completed the deal for a tract of land embracing 34,070 acres. The land will be drained and converted into ten and thirty-acre farms. F. W. Hodson, former secretary of agriculture and commissioner of stocks of Canada, who recently resigned as land agent of the Union Pacific railroad, is in charge of the project.

(Continued from page 455.)

a minimum price of \$5.00 per ton. Twelve to eighteen tons per acre and often more, are raised. Thus the farmer receives a gross return of from \$75 to \$100 per acre for his beets.

This country is the home of the famous Rocky Ford netted cantaloupe. There is always a ready market for them and \$100.00 per acre net profit is not unusual, and many cantaloupe raisers get \$200.00 and often \$300.00 per acre. The seed of this cantaloupe have been spread all over the country, but nowhere in the world do they have so juicy a flavor and solid a meat as in the Arkansas valley. Solid trains of cantaloupe pass through Holly in the season bearing this luscious fruit to the Eastern market, where it brings remarkable prices.

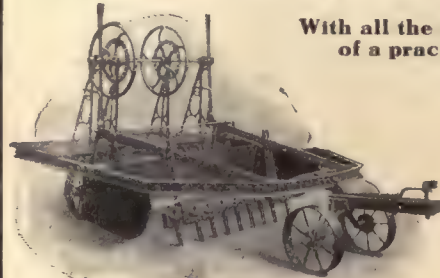
These lands under the Amity canal are remarkably adapted in climate, soil and sunshine to the raising of all kinds of small grain and vegetables. Forty to sixty bushels of wheat per acre are not unusual in this locality. Oats yield from fifty to one hundred bushels, and all other grains do equally well. This country is the natural home of the truck gardener. Cabbage, tomatoes, celery and all vegetables of the finest quality grow in profusion.

Cattle and sheep feeding is one of the great industries of this locality. Free range extends both north and south of the district to an unlimited distance. Thousands upon thousands of cattle and sheep are brought from the range and fattened on beet pulp, beet tops and alfalfa hay, which produces such solid, juicy meat that it brings as high prices as corn fed cattle in the markets at Kansas City.

Of the 20,000 acres remaining to be sold, 10,000 acres were just placed on the market. This land lies within one to five miles of Holly and in respect to its location and levelness it excels any that has yet been sold. Another year will see this land dotted with happy homes where the farmer of the rain belt, worn out by anxiety of drouths and floods, has sought his home in a country where he can say, "Let there be rain" and there is rain. Not rain with a cloudy sky and muddy roads not long days of drizzle and mist when he has to stay in doors and watch the water choke his crop, but rain with a clear sun in the sky; rain wherever he wants it, on his beets and alfalfa, and not on his wheat, rain on his fields, and not on his roads. Truly wonderful changes have swept over this country in Eastern Colorado in the past twelve years. Railroads have been built, towns have sprung up, sugar factories and alfalfa mills have been erected, schools and churches are scattered far and wide throughout the country.

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With all the features
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Ditcher
Digger
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Cut showing diggers and fenders attached. These can be removed and the blade set for lateral ditching in five minutes.

BLADE COMPLETELY REVERSIBLE
WHEELS FITTED WITH FLANGED RIMS AND
DIRT PROOF BOXES

Lightest draft. No weight on horses' necks. A "snap" for teams and operator

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Oberlin, Ohio

Box F.

Books on Irrigation and Drainage

The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

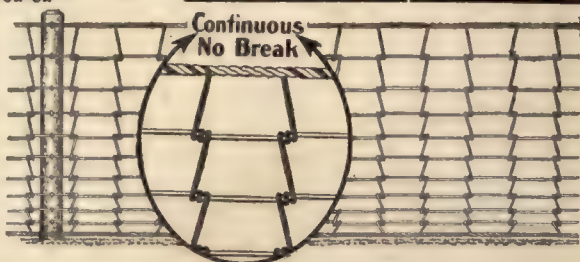
Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
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Fence sent straight to
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30 Days' Free Trial



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An offer for the farmer who wants the best fence produced at the lowest price a life-time fence can be made for. Advance Fence isn't just a boundary line. It stands for system and advanced value in property. Any farmer who subdivides his land into plots for crop rotation is systematizing his farm business. A built-to-last, sound-value, substantial-looking fence means to the owner of the land, and every man who works on it, exactly what a modern, substantial factory or office building means to every man doing business in the building.

ADVANCE FENCE "The Fence That's
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Is An Investment That Pays Big Dividends

What the farmer puts money and protection into, he's going to get money and protection out of.

Advance Woven-Wire Fence is the best looking, strongest constructed, longest lasting fence on the market. To prove it, we make our great offer. If the fence isn't O. K. to you, and more, send it back at our expense.

We sell to you direct—no middleman—therefore the price is right—one profit only after making.

Advance Fence is made of Solid Wire, not wire cut and spliced again. A cut wire weakens. Our stay wire is continuous, woven in with the main top and bottom wire running the entire width of the fence from one stay to the next. Made of the best basic, open-hearth steel, galvanized with a heavy coat of 99-per-cent-pure spelter—that means rust proof.

Advance Fence always stays taut—straight and handsome. Prove it for yourself. Write to us for all particulars. Remember, we pay freight and guarantee safe delivery. Don't pay two prices—Write us today.

ADVANCE FENCE CO., Box 123 Elgin, Ill.

(Continued from page 458.)

And this is equally true of the drainage. You can take up a separate and individual survey of any 40 and can show a man just how many square yards of each particular 40 he will be able to get water upon. And the matter has been so admirably handled that there is next to no waste land anywhere from lack of either water or drainage.

It is most complimentary to the engineers and through them to the gentlemen back of this project that the buyer shall not be sold anything that cannot be successfully irrigated. There will not be anything sold to the buyer that is valueless. If there were a disposition on the part of any of you, as I know there is not, to sell something without value, by that I mean land that is a little too high to get water upon or a little too low to be successfully drained, you cannot do so.

For this matter is completely covered by the engineering and it is not the policy of Messrs. Kuhn, or Mr. Ross to permit anybody to be deceived.

Now, gentlemen, back of all this, and back of all that I have had to say to you, and independent of anything that I might say to you, is the name KUHN.

While they might not have said so to you, and while some of you may not know their policies, there are probably others of you who do know that this is undoubtedly to be the Kuhn masterpiece—the Kuhn monument and there is not a thing that you can think of that will not be done by these people for the best development of this Sacramento Valley project.

There was not a thing that I could ask a question about that was not already covered or under consideration.

I think I may say to you therefore in all honesty that you may sell these lands to anybody with your eyes shut. And to you present who are interested as probable purchasers, let me say that you may walk up to any piece of that land backwards and say, "Give me that," and you shall be perfectly safe.

HART-PARR GAS TRACTORS

SAVE
MEN

SAVE
HORSES



SAVE
MONEY

SAVE
WORRY

The latest development in labor machinery is the **HART-PARR GAS TRACTOR**, which is revolutionizing farming methods. They displace many men and more horses, and are always ready for service and eat nothing when standing idle. Think what it means to have cheap power and plenty of it, always at your command. You can use these Tractors for plowing, discing, seeding, harvesting, threshing, hauling, hay baling, feed grinding, running irrigating pumps—in fact, all kinds of heavy farmwork.

Use Gasoline, Kerosene, Distillate or Alcohol. Hundreds in Successful Operation—Built in sizes of 30, 45 and 80 H. P. OIL COOLED, FROST-PROOF, FIRE-PROOF.

Our 48-Page Illustrated Catalogue tells you all about them. Write for it today.

HART-PARR CO., 240 Lawler St., **Charles City, Iowa**

(Continued from page 434.)

and Scott as president and secretary. Committee meetings are held, the newspapers keep pushing the matter, the state engineers of Kansas and Colorado cooperate, the good roads office at Washington, and D. W. King, of Maitland, Missouri, creator of the famous King road drag, are constant correspondents, and the road is actually building, day by day.

It is the firm belief of many good road advocates that farmers will not participate in a good roads movement. The Trail-builders found this a mistake. In the Hutchinson conference half the delegates were real farmers. The farmers of Kansas and of Colorado, in the wonderful Arkansas valley, are finding out the value of good roads. Of course, the motorists are for the road because it makes a swift, short-cut to Colorado and down the valley.

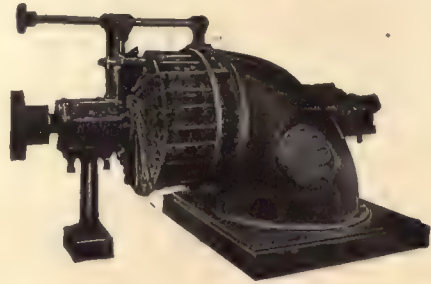
The road is built, then, up the Arkansas valley, the most fertile section in all the West, with its seven beet sugar mills, its more than a half million acres of irrigated lands, its alfalfa, beets, trucks, melons, wheat, and corn, and fruit. It is, too, a great advertisement for the valley, incidentally.

The New Santa Fe Trail is linked closely with the work of the great development of the West and the Arkansas valley, that will culminate September 26-30 in the greatest event of the West and the valley—the eighteenth National Irrigation Congress, to be held in the city of Pueblo, the capital of the Arkansas valley, this year.

Most of the Trail-builders, especially in western Kansas and in the Colorado valley, are leading proponents of the work of the congress. President Faxon is secretary of the board of control of the congress. W. M. Wiley, of Holly, Colorado, a member of the Colorado state highway commission, is an active member of the board of control. The destiny of the highway, of the Arkansas valley it traverses, and of the great irrigation congress, the most important gathering ever held in the valley, is one and the same.

And it all spells the great development that is on in the heart of the Middle West today.

SAMSON TURBINE



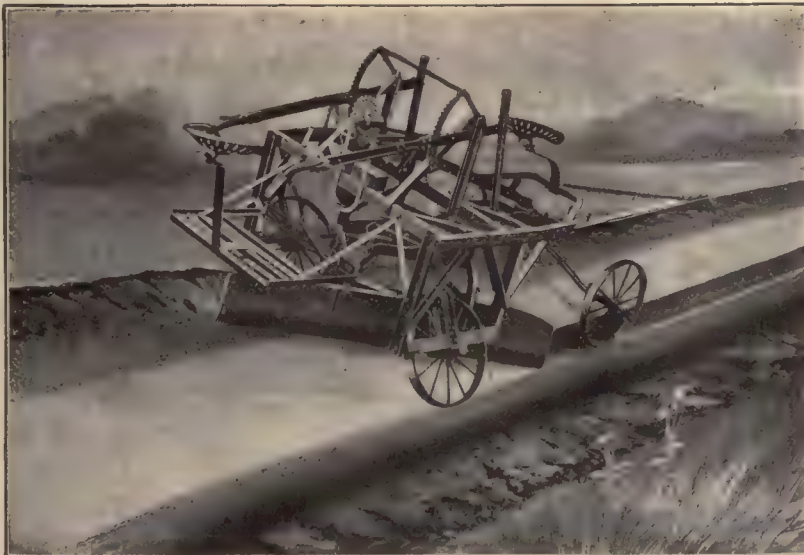
When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the **HIGH SPEED** of the SAMSON, for a given power, lighter and consequently **CHEAPER** transmission machinery can be used.

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316 Lagonda Street

The Little Roadster Grader and Ditcher



THE LITTLE ROADSTER

A New, Light Ditch Plowing Machine, Especially Designed for Cutting Small Laterals on Irrigated Farms, and Ditching and Grading Roads.

This type of machine cuts ditches for less money than any other tool or machinery, because it plows the dirt out of the ditch with one continuous motion, whereas all other ditching machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling land-sides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

EVERY IRRIGATED RANCH OR FARM NEEDS ONE OR MORE OF THESE MACHINES. IT WILL QUICKLY PAY FOR ITSELF. SEND FOR DESCRIPTIVE FOLDER AND LET US TELL YOU MORE ABOUT IT

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(Continued from page 441.)

about three miles wide, east and west. On the Southern Pacific Railroad, near the center of the west side of the tract, is the town of Patterson. The civil engineer who laid out this new townsite has done beautiful work. The town will lie entirely west of the railroad, thus insuring the location of the lumber yards, stock yards and other business institutions of like character, on one side of the town, rather than in the center of it, and on the opposite side of the railroad; also making it possible for children to attend school without crossing the railroad tracks. The streets, of course, run parallel to, or at right angles with, each other; the avenues, starting at the corners of the town, converge in the center of it, in a circular park around which will be located banks, post-office, hotel and business houses. The convenience of this arrangement for business purposes is apparent. In addition to this excellent feature, it will beautify the city, as the roadways of the avenues and streets will be oiled and then lined with trees, such as palms, peppers, magnolias and oleanders. The residence portion will occupy the sides and ends of the city on the longitudinal and latitudinal streets. From the circular park will be a broad avenue extending across the railroad track, and through the colony west, for a distance of three miles, where it reaches the river. It will be perfectly graded and oiled and lined with palms. This will be the main thoroughfare from the city to the boat landing on the river. Cement gutters and sidewalks, water-works and other modern conveniences will also be properly looked after, and no point will be overlooked that will make Patterson one of the most charming cities.

IRRIGATION PLANT FOR SALE

On account of death of owner, I desire to sell at once an Irrigation Plant in Utah, nearly completed, and consisting of 7000 acres.

W. B. Lowrance,
 Attorney-at-Law,
 Topeka, Kansas.

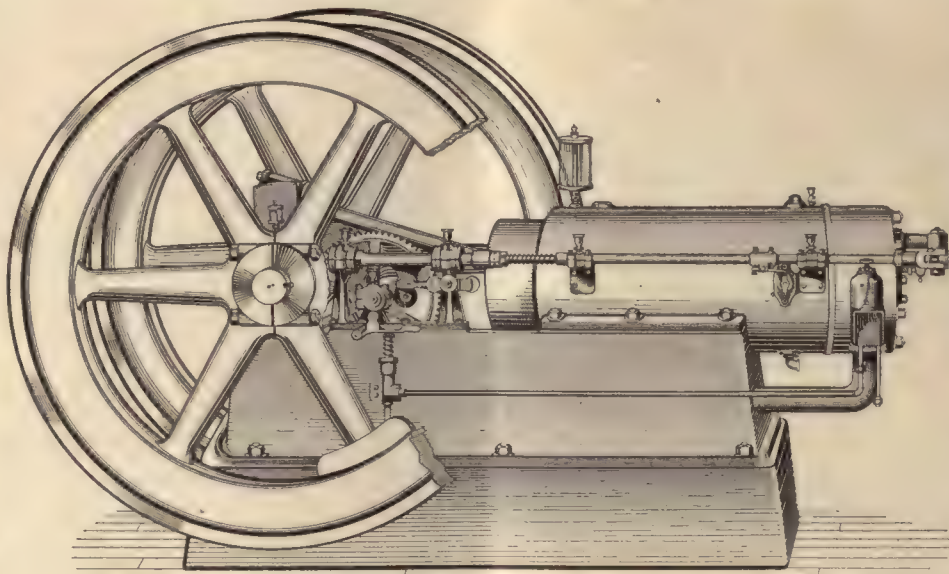
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(Continued from page 438.)

This is a very important item to the farmer. It insures the building of a sugar beet mill at some convenient point in the valley when the farmers are ready to produce the necessary amount of beets to warrant its erection.

It also insures a good market for all the products that can be grown, because the commission merchant, the grain buyer and the produce dealer naturally look for the community that is able to sell them their products in sufficient quantities to warrant them a successful business.

Aside from the benefits from a financial standpoint in residing in a valley like this is the certainty of good schools, churches, and all of the modern improvements that go to make up a refined and cultured home.

One can look ahead only a few short years and see this broad valley dotted with beautiful homes, surrounded by orchards and fields of growing crops, all connected by telephones, with their mail delivered to them daily, and wonder if it is possible that it is the same valley that he saw before, when only a few wandering droves of cattle were the only evidence of life.

(Continued from page 432.)

It is stated that the Fountain Valley Land & Irrigation Company is acquiring other rights and will extend this supply to cover much larger areas. Some of the prior rights which have been purchased by the company in connection with the purchases of land lying along the Fountain river will greatly augment this supply.

Land in this tract may be purchased today for from \$115 per acre upwards. This price includes full water-right. The only additional charge is a maintenance fee for each year, which is encountered in all irrigation work.

Finely illustrated folders and booklets fully describing this property, giving testimonial letters from settlers as well as letters from others who have studied it from the viewpoint of engineers and irrigation experts, may be had by writing the Fountain Valley Land and Irrigation Company, Colorado Springs, Colorado.

Invest in Irrigated Land

The greatest opportunity ever offered to purchase an irrigated farm at a reasonable price is now given **YOU** by the opening of 16,000 acres of the richest and best land in the Pecos Valley, Texas.

You can now buy land that will double in value in two years, or if you wish to farm the land purchased it will net you 50% after the first year if sowed in alfalfa and larger returns if planted with fruit after trees begin to bear. Alfalfa can be cut five to seven times per season and will average from one to two tons per cutting. Alfalfa is now selling at \$16.00 per ton. Secretary Coburn, of the Kansas State Board of Agriculture, says that this great valley will be the "pear orchard of the world." What is true of pears is also true of apples, peaches, apricots and grapes.

A few of the reasons why an investment in this land must produce large results

First: It is one of the richest and best bodies of land ever opened to settlement.

Second: The Santa Fe Railroad runs eleven miles through these lands and no forty-acre tract is more than two miles from the railroad or three miles from a railroad station.

Third: The market is one of the best in the world. Its climate is healthful and delightful.

Fourth: The irrigation system has been completed at a cost of over \$300,000.00 and these lands are irrigated NOW and water in the ditches, and **YOU** get a perpetual water-right with your deed and become part owner of this great irrigation system.

These lands are now selling at the opening prices, which prices will be raised from 25% to 33 1/3% within the next sixty days. **THIS MEANS MONEY TO YOU IF YOU BUY NOW.**

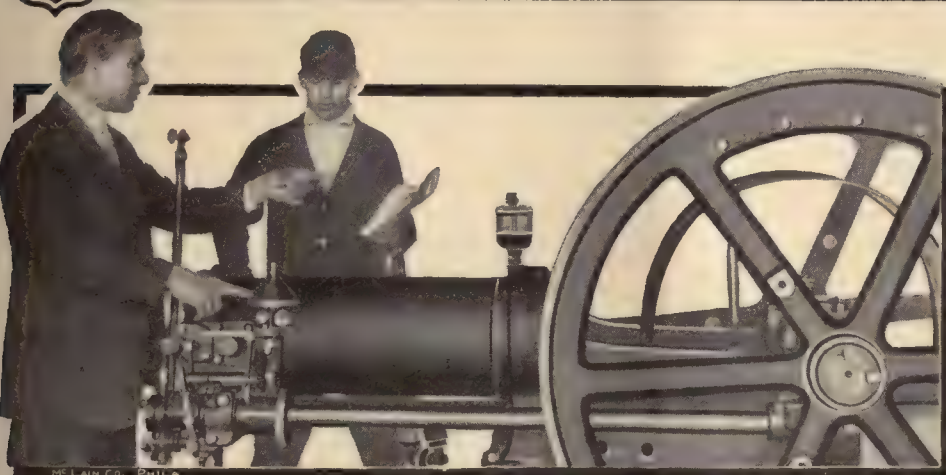
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The Otto Gas Engine Works, Phila., Pa. Gentlemen:—Regarding economy in running, etc., the plant recently installed for us, consisting of your No. 9—40 actual H.P. and No. 10—50 actual H.P. engines and a 120 H.P. "Otto" Suction Gas Producer, we are using on an average not to exceed 800 lbs. of anthracite pea coal per day of ten hours. This coal costs us \$3.65 per ton delivered at our mill, which means a total cost of running the two engines of \$1.36 for fuel.

Before installing this plant we had in use a gasoline engine, not of your make, fuel for which cost us over \$6.00 per day. Our saving therefor is \$4.64 per day and the present plant has 33 per cent more power.

One man has the care of engines and producer, which requires his attention probably about three hours per day, he being occupied the balance of his time with other duties. Yours truly,

Taylor Bros.

A FOURTH REASON—THEIR SIMPLICITY

Another strong advantage of OTTO Gas Engines and Producers is their simplicity in construction and operation. They say that besides saving \$4.64 per day their plant has at least 33% more power since installing the OTTO. And in addition to all this they state that one man spends only about three hours per day taking care of two OTTO Engines of 40 and 50 H.P. and an OTTO Gas Producer Plant of 120 H.P. Besides you do not need a licensed engineer to run an OTTO Gas Engine Plant. Our expert who makes the installation does not leave until the operator who is to have charge of the plant is fully informed and entirely capable of managing same. When he does leave, the attendant is supplied with our instruction book containing full instructions and complete explanation of all details. By this means any man of ordinary mechanical ability by simply following instructions can successfully operate an OTTO engine and Producer Plant. Let us estimate just what the OTTO will do for you. Let us send you some letters from actual users right in your line of business. We'll do anything we can to help you find out how much an OTTO Suction Gas Producer Plant would be worth to you. Just sign this coupon and send us any other information you can. Tell us any special difficulty you're up against—we'll help you overcome it. Sign the coupon now.

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Gas Producer Plant of _____ H.P.
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(Continued from page 431.)

the supply of available nitrogen. This is done by the use of legumes which, through the action of the bacteria on their roots, gather nitrogen from the air. Grain, peas or potatoes may be grown as the first crop after breaking the sod. If grain is the principal crop produced, the soil should be improved by raising a crop of peas, beans, vetches or alfalfa. Peas may be grown and plowed under to add vegetable matter. Alfalfa continually enriches the soil in nitrogen and at the same time produces profitable crops wherever the conditions are favorable. Where alfalfa is easily grown it may be plowed up at the end of three, four or five years, but if difficult to get a stand and a good field is secured, the farmer would be reluctant to plow his alfalfa so long as it is giving him good results. It usually begins to deteriorate after seven or eight years. This is due to wrong management. Alfalfa rightly managed, in some parts of the world has stood the test of time not 8 years but 180 years or more. Each farmer must work out his own system of rotation which is applicable to his conditions, but these suggestions will be valuable to him.

Arid soils are so rich in mineral elements of fertility which are made available by thorough systems of tillage, that the use of complete fertilizers has not become a question of importance. These soils are generally poor in nitrogen and decaying vegetable matter, and adding these things always brings important increase in yield. One of the very best methods of adding nitrogen and vegetable matter is green manuring with legumes. Plowing under such green crop puts into the soil a quickly-decaying supply of vegetation and the legumes gather much nitrogen from the air which they make available to other crops. There are some places where the use of nitrate of soda gives good results. A system which enables the farmer to return the crop to the soil in the form of manure cannot be too strongly recommended. Raising a crop of feed which is used by the animals harvesting it themselves in the field, like pasturing to fatten on peas, both returns the manure and spreads it. Where manure accumulates in the feed lot or barn it should always be applied to the land, and a manure spreader is becoming a necessary implement on all modern farms. The sooner manure can be spread on the land after it is made the better the results to soil and crops.

AGENTS WANTED. Cheap Irrigated lands. Big proposition. We are arranging now for next season's business. Good inducements for locating actual settlers.

Address Manager

AMERICAN RIO GRANDE LAND AND IRRIGATION COMPANY, Mercedes, Hidalgo County, Texas.

(Continued from page 423.)

reviewed the work that had been done to date. The board passed approvingly on the work not only of the national secretary, Mr. Hooker, but of the board of control in its preliminary task, its promotion and organization, and its plans for the congress. The board of governors felt, after this exhaustive review, that there was no doubt of the success of the sessions at Pueblo in September next.

A Big Attendance Assured.

As to attendance, there can be no doubt. Secretary Hooker and the local board of control believe there will be not less than 3,000 accredited delegates, with a total attendance of not less than 10,000 persons. This will easily make the Pueblo sessions the most attractive, the most successful, and the largest attended of any heretofore held.

The board of governors also arranged tentatively the program. This includes some of the most distinguished men in the country. It is not proper to print very much about the program at this stage, for, as stated, it is entirely tentative. It is never given out officially until the day before the congress, when the executive committee has definitely approved it.

Sufficient is known, however, to insure the statement that it will be the most interesting program of any of the previous sessions. Government officials, members of congress, governors, engineers, technical men, reclamation and forestry experts, soil experts, railroad presidents, and practical farmers and irrigationists will appear on it. A feature is to be made of 5-minute talks from the platform.

Profound interest, as stated, exists all over the State of Colorado in this congress. Colorado has long been known as a mining state, but only recently has secured proper recognition as an agricultural state. This is due entirely to irrigation. With more than 3½ million acres of irrigated lands in the state, with four fruitful sections which are perfect Gardens of Eden, and with a constantly growing population, Colorado is prepared to do homage to the cause of irrigation. Opportunity exists anywhere in the state, and the end is not yet.

It is the confident belief of the alert, energetic men carrying on the work of preparation of the Eighteenth congress, and of farseeing citizens generally, that the attention being diverted to Colorado, the Arkansas valley, and Pueblo this year will send ahead this great development at a rapid pace. New irrigation projects, new beet mills, new alfalfa fields, new orchards, new truck gardens—these are probabilities not at all uncertain because of irrigation. Thousands of acres of new projects, for instance, in the famous Pueblo and Arkansas valley districts, are under way, entirely assured, with adequate water rights and with confident settlers-to-be awaiting their completion.

Colorado's perfect climate, its months of golden sunshine, its rare atmospheric conditions, its splendid growing seasons, with an abundance of water under irrigation and a soil unparalleled, give firm hope to those now engaged in the prediction business.



HOW IS THIS FOR HIGH? OAT FIELD NEAR ST. ANTHONY

Irrigated Crops Never Fail

The Upper Snake River Valley in Idaho has the Soil, the Sunshine and the Water. More than fifty large canals now completed and owned by the farmers of our county. Guaranteed water rights sufficient, with lands that yield 6 tons of alfalfa, fifty bushels of wheat, 100 bushels of oats, 600 bushels of onions or potatoes, and 20 tons of sugar beets per acre. Fine Climate. For information and illustrated booklet write

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PREPARATION OF SOD FOR MILO.

Milo may be planted on sod land and successful crops may be grown if it is properly prepared for planting. On sod, a seed bed should be made by breaking the land, and if there is a considerable amount of grass roots so that the sod is rather stiff, the best preparation is obtained by rolling the sod down until it is perfectly flat, when it may be harrowed to produce a soil mulch at the surface. The milo may then be planted with a disk drill, stopping up the drill holes which are not desired. If the sod is very thin, that is, if there is not much turf in the sod, it can best be prepared by thoroughly disking and harrowing until a seed bed is formed.

Both of these methods, under proper conditions, promise success, as both have been successfully practiced in different localities and under different soil conditions.

ALVIN KEYSER,

Colorado Agricultural College, Fort Collins.

When the people at Washington get down to brass tacks and talk sensibly about this conservation business we are ready to go into camp with them. In a recent message to congress President Taft said: "The problem is how to save and how to utilize; how to conserve and still develop our natural resources." This announces a policy of conservation with which the west is entirely satisfied. While the bug has gone out through Pinchot's press agents that the west is opposed to the conservation of natural resources, as a matter of fact we are in entire accord with any sensible policy. We believe in economically caring for that which forms so large a part of the wealth of this country. Any policy which will save and at the same time utilize our resources, which will conserve and still develop, which will utilize them and still prevent monopoly, is a policy for which the west will stand until the cows come up. We desire, however, to have something to say about the modus operandi of all this conservation business and will always stand out for the right of the states to have something to say about it.—Field and Farm.



Harvesting 100 Acres Per Day.

Harvesting with the Farm Tractor is the latest step in modern farm methods. The songs of the jolly harvester have given way to the busy chug of the Gas Tractor and the hum of binders following. Instead of the six or seven-foot swath, which used to be cut with horses, the Modern Farm Horse of steel walks along with four or five binders, cutting a swath thirty or forty feet wide, and if necessary, will keep this up night and day, which the horse of flesh cannot do.

The above illustration shows the two traction outfits owned by J. R. Smith of Beach, N. D. These binders are drawn by a Hart-Parr oil-cooled Gas Tractor, using kerosene for fuel. In the season of 1909 Mr. Smith plowed, disc and seeded to flax two thousand acres of raw prairie land. The crop was afterwards harvested, threshed and hauled to market with the Tractors, and sold at the elevator for \$48,000. Besides this, one thousand acres of sod was plowed after it was too late to seed. The Modern Farm Horses were then put under shelter and Mr. Smith departed for the "Sunny South" to spend the winter. Such is modern farming.

WITTE ENGINES

Gas—Gasoline—Distillate

cheapest and best power known. Average cost one cent per horse power per hour. A superior standard of construction saves time, fuel and repairs. We refer you to thousands of satisfied customers. High grade engines our specialty for 25 years.

This engine is built for those who want the best. We furnish any size or style; hopper jacket or water tank type. We ship promptly. Everything is complete. Our prices are right. Inducements to introduce in new localities. Write for catalog, stating size wanted.

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for its equal. Wind power doubled. Two 14 ft. wheels work on same pinion; second wheel gives more power than first.

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in all winds. Develops 10 full h. p. in 20 mile wind. All power needed for farm, shop, irrigating, etc. Ask about our self-rolling, self-governed, single wheel pumper—also Armsaver Husker. Ask for book 60

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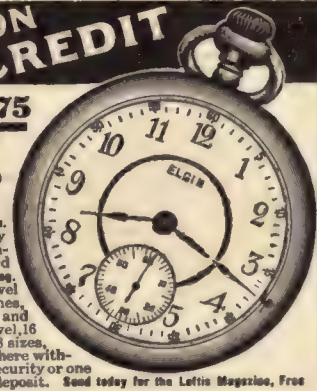
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What The Land Hungry Man Can Get From Uncle Sam on The Sun River Irrigation Project, Montana.

The Sun River Irrigation Project in central Montana possesses many new and alluring advantages. The soil in the territory is remarkably fertile, the water supply inexhaustible, the climate ideal. It is situated close by growing home markets, has first class transportation facilities and unusual social advantages. No one will be over six miles from a town. The farm village idea will be carried out all over this project. Already two thriving towns have been started, and hundreds of families are today making homes and independence for themselves on the Fort Shaw Unit of this enormous project.

The Sun River Valley has an average altitude of 3,700 feet, high enough to make the air clear and healthful and provide a long and vigorous growing season for all manner of crops. The days are full of sunshine, the nights cool and restful.

Three hundred thousand acres of land in the Sun River country, lying just east of the Rocky Mountains, will eventually be irrigated. The plans have been made. As rapidly as the farming population increases on the section already placed under the ditch, new irrigated farms will be provided. The Fort Shaw unit of the project has already been completed. Most of the farms in this unit have been taken. Bumper crops have been raised the past two years, and now only a few choice farms remain.

Large home markets practically surround the project. Great Falls, Butte, Helena and Anaconda, with their mining, commerce and manufacturers, today create a demand far in excess of the ability of the surrounding farming territory to supply. Great Falls, a growing city of upwards of 25,000 people, on one of the transcontinental lines of the Great Northern Railway, is the nearest big market. On account of its natural location, its river and railroad advantages (five lines of the Great Northern Railway radiate from this point) the tremendous horse power capable of development in the Missouri, on whose banks it is builded, will soon become the largest city between Minneapolis and Spokane. Its own flour mills now use more grain than can be procured locally.

These farm homes, with their unusual advantages are procurable from Uncle Sam on most advantageous terms. The land is virtually free. The settler pays only for the water and a permanent water right. The government engineers who are building this project, estimate the full cost of constructing the necessary engineering works, and placing the water on practically all the land embraced in the project, assuring the settler a permanent water supply for all time, to be \$30.00 per acre, plus an annual maintenance charge of 50 cents per acre. To acquire title to the land the settler must live on his allotment five years. Ten years are allowed in which to settle with Uncle Sam, the \$30 charge being divided into ten easy annual payments without interest.

While at present these figures are estimated for that portion of the project not yet constructed, it is the actual basis on which the farms now obtainable on the Fort Shaw Unit can be obtained.

A new idea has been advanced by the government in the location and selection of these farms. They range in size from forty to sixty acres. The exact size of each farm is determined by the government. The home maker selects his farm from these units. Every acre in each unit is not irrigated. The settler pays only for the acreage under the ditch, the balance is acquired through the homestead feature. For example, on 160-acre sections not more than 110 acres are irrigated, the balance is pasture land. This makes possible the profitable raising of hogs, cattle and sheep. Dairying is also profitable.

The climate in the Sun River Valley is ideal for irrigation. The soil is quickly subjected to the plow. It is covered with a good growth of luxuriant natural grass and is lumbered with no sage brush or timber.

The crops here are sure and substantial. Sugar beets grown in this section have over twenty per cent more saccharine than is found in the beets from other sections. This is due to the long sunshiny days. The returns from

irrigated lands are almost miraculous when compared with soils which depend on uncertain rainfall. Owing to the small size of the farm units the neighbors are near. The labor, drudgery and isolation of the farms further east are eliminated. The farmers on irrigated lands are working under the most favorable natural conditions. Water is available always when needed. No damaging rain storms come at inopportune times, nor do discouraging droughts occur when crops have almost reached maturity. On the Sun River project drainage ditches have been constructed which make it impossible for alkali to rise in the soil. This protects the farmer in case too much water is placed on the land. An experimental farm is conducted by the government for the guidance of the settler.

Two new lines of the Great Northern Railway are now being built in this vicinity. One passes through the Fort Shaw Unit. The average distance from a railroad station is now only nine miles.

Wheat averages thirty bushels to the acre on the Sun River Project; oats, 35 bushels; potatoes, 175 bushels. These crops are especially adapted to the soil of this region, likewise barley, alfalfa, sugar beets and small fruits. Sun River alfalfa seed has proven superior to Utah alfalfa.

A man of moderate means, who takes up one of these farms can achieve an enviable position of independence provided he follows the methods of cultivation proven most advisable by government experts on the experimental farm. A married man should have about one thousand dollars in cash or its equivalent in stock, tools, machinery, etc. A shelter must be provided for the family, and food and other supplies purchased over winter. A single man may succeed with smaller capital provided he will take advantage of the many opportunities afforded him for outside employment.

The Sun River Irrigation Project offers a plucky man more than a fighting chance to win a competence and leave a valuable heritage to his children. The social advantages here are in many ways superior to the east. The schools are excellent. Telephone lines, churches and schools are being built, and mail routes established. The process of development is well under way. The opportunities are there now. Sun River Project offers a new chance in a wholesome, healthful atmosphere for those who are wise enough to grasp this opportunity.

Send for Montana Booklets

THE Great Northern Railway has published several booklets describing the opportunities in the towns and cities, the farms and fruit lands along its lines in Montana. These chances are to be found in the Sun River Irrigation Project, the Milk River Valley, Flathead Valley, and many other sections of Montana. Write for free illustrated booklets. Address S. J. Ellison, General Passenger Agent, St. Paul, Minn., Great Northern Railway.

(Continued from page 465.)

RIGHT TO APPROPRIATE.

The right to use waters on the public domain for a beneficial purpose may be acquired by mere appropriation, and the first appropriator takes against the world to the extent of his established appropriation, though at the time of his application to the state engineer he has no present right in the lands bordering the source of supply nor in the lands to be benefited; he being entitled to conduct the water across intervening public land to irrigate lands held by him or others or to dispose of it for a beneficial purpose on lands held or owned by them.—*Sowards v. Meagher*. Supreme Court of Utah. 108 Pacific 1112.

IRRIGATION PROJECT.

Where, by a contract between the United States and landowners tributary to a federal irrigation system, such landowners agreed to pay to the United States the charges duly levied against their lands for the construction and maintenance of the system, they were only liable for such reasonable charges as the government was authorized to collect, proportionate to their shares of the cost of maintaining and operating the system, and not such as might be arbitrarily fixed in advance by such secretary or other governmental officer.—*United States v. Cantrall*. U. S. Circuit Court, District of Oregon. 176 Federal 949.

RAILROAD RIGHT OF WAY.

That the United States may in the future reasonably require rights of way for ditches, in furthering a reclamation project, in addition to those now occupied by existing canals, and that it may be entitled to reserve land therefor under General Appropriation Act, Aug. 30, 1890, c. 837, 26 Stat. 391 (U. S. Comp. St. 1901, p. 1570), providing that, in all patents for land thereafter taken up under the United States land laws on entries west of the one hundredth meridian, land shall be expressly reserved for a right of way for ditches and canals constructed by the authority of the United States, did not prevent a railroad company from occupying lands in present legally conveyed to it within a reclamation reservation by a homestead entryman.—*United States v. Minidoka & S. W. R. Co.* U. S. Circuit Court, District of Idaho. 176 Federal 762.

RIGHT OF WAY FOR IRRIGATION.

Rev. St. 1895, art. 3126, granting to corporations formed for irrigation purposes a right of way not exceeding 100 feet in width over public lands, with the use of the rock, gravel and timber on the right of way for construction purposes, and authorizing such corporations to obtain a right of way over private lands, and also land for dam sites and reservoirs, grants over public lands only the right of way with the use of materials therein for construction purposes, and does not grant the right to appropriate such lands for dam sites and reservoirs, and the fact that the use of public lands for a reservoir may be indispensable to the project as designed by a corporation does not justify it in taking public lands for such a purpose.—*Jayne v. Imperial Irr. Co.* Court of Civil Appeals of Texas. 127 Southwestern 1137.

PRESCRIPTION.

Defendant owned a ranch bordering on a stream and used the waters thereof for irrigation by a ditch to carry the waters to portions of the ranch adjoining the ranch of a third person, who by the consent of defendant extended the ditch to his ranch and used a part of the water. Plaintiff, owning an adjacent ranch, extended the ditch to his lands, and used the waters with the consent of the defendant. Defendant had complete control of the waters and of the ditch so far as it extended over his ranch, and plaintiff never used the waters under a claim of right. Held that plaintiff did not acquire any right to the waters by prescription, notwithstanding a special finding that the waters were used by the interference of plaintiff.—*Davis v. Martin*. Supreme Court of California. 108 Pacific 866.

APPROPRIATION OF WATER RIGHTS.

Mills' Ann. St. section 2268, provides that the owner of a meadow watered by the natural overflow of a stream may, when such flow is diminished by the construction of irrigation ditches by others, construct a ditch for the

irrigation of the meadow. Section 2434 authorizes a claimant of an irrigation priority within four years from a final decree in a statutory adjudication proceeding to bring any suit hitherto allowed by the proper court to determine the priority. Section 2435 provides that after four years from a final decree all parties whose interests are affected shall be deemed to have acquiesced in it, and thereafter all persons shall be forever barred from setting up any claim to priority adverse or contrary to the effect of the decree. Held, that the claimant of a right under section 2268 in favor of a ditch constructed subsequent to a general adjudication decree could not, more than four years after such decree, maintain a proceeding to establish his right relating back to a date prior to the rights adjudicated in the general decree.—*Broad Run Inv. Co. v. Deuel & Snyder Improvement Co.* Supreme Court of Colorado. 108 Pacific 755.

APPROPRIATION.

The rule that, where rights to lands across which a stream flows are acquired or initiated prior to any appropriation of the waters of the stream, the rights of the riparian proprietors are determined by the rules of the common law governing riparian proprietors in force in the state, and not by any rule of prior appropriation, applies to springs existing from time immemorial, or of new creation, and they may only be appropriated if existing or appearing on the land to which no title has been acquired from the government, or initiated looking to such acquirement; and, where an owner of land made no appropriation of the waters of springs until long after initiatory steps had been taken by others to acquire title to the land on which the springs appeared, the latter could hold the springs and claim the waters as against any claim of prior appropriation.—*Mason v. Yearwood*. Supreme Court of Washington. 108 Pacific 608.

RIGHTS OF APPROPRIATOR.

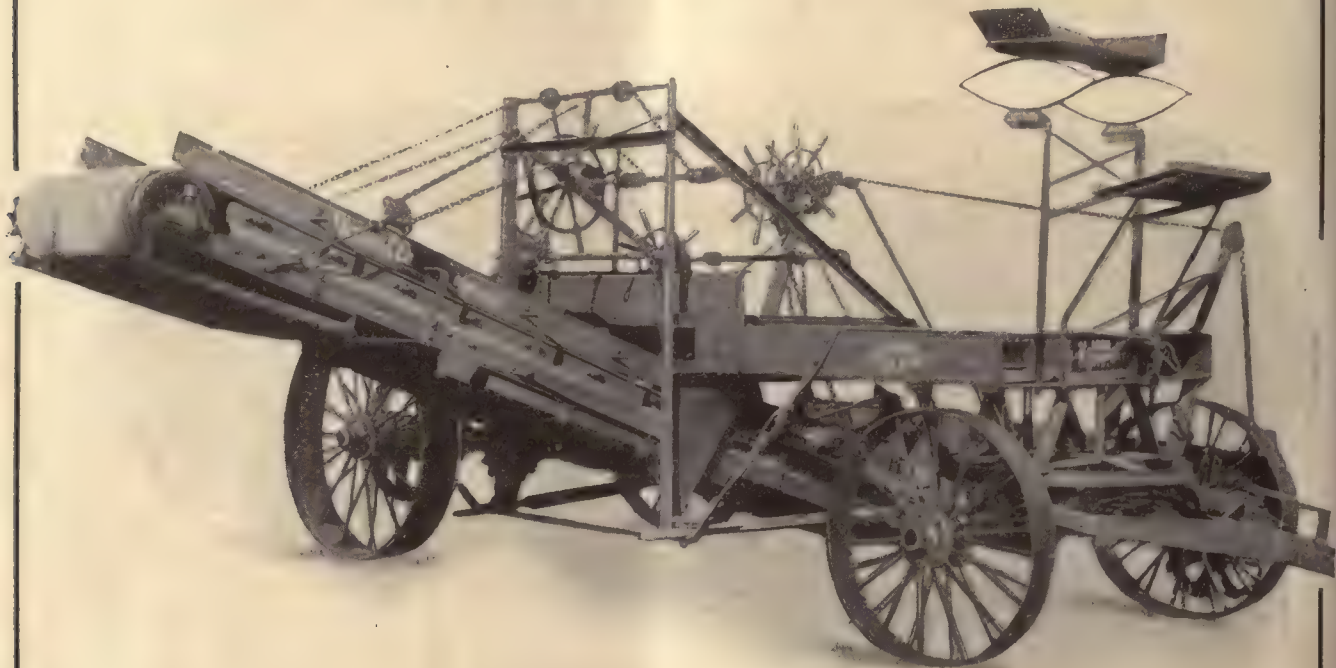
Where a prior appropriator of surplus and flood waters in a gulch had previously maintained a dam below a subsequent appropriator, which dam had been destroyed, and, at the time the subsequent appropriator had initiated his rights, was making no use of the water flowing to the lower dam, and had not reconstructed the dam at the time his action was brought to be decreed entitled to all the water in the gulch, and though, from the evidence, it could not be said that he had abandoned his rights to use the water at the lower dam, yet a further failure to use it might entail such result, the court could not practically fix a time within which he should resume its use or suffer its loss, and adjust the parties' rights growing out of the prior appropriation of water to be impounded by his lower dam, because of the many circumstances that might arise in connection with the rebuilding and maintenance of the dam.—*Sullivan v. Jones*. Supreme Court of Arizona. 108 Pacific 476.

APPROPRIATION.

Plaintiff's intestate in 1901 took possession of land surrounding springs on arid and unsurveyed public land, erected a cabin, constructed a corral, and fenced in a few acres. Until his death in 1905, he maintained the corral and fences, and a portion of time each year lived in the cabin, and while living there used the water for culinary purposes and to water a team and saddle horse, but never used it for irrigation. Prior to 1901 sheep and cattle men used the water, and thereafter intestate occasionally required the sheep men to pay for the water while the cattle men used it without, but neither disputed nor interfered with intestate's right to use the water. Defendant, a cattle man, watered his cattle at the springs for a number of years. Held, that intestate, although he might have been a trespasser on the land, acquired the right to use the quantity which he used, and, although he posted no notice that he intended to appropriate the water in accordance with the law in force in 1901, the notice and record thereof being merely prima facie evidence that the person giving the notice was applying the water to some beneficial use, so that plaintiff had the right to use the quantity of water used by intestate, and even if he had no right in the land surrounding the springs, he could divert it to some other place, if possible.—*Patterson v. Ryan*. Supreme Court of Utah. 108 Pacific 1118.

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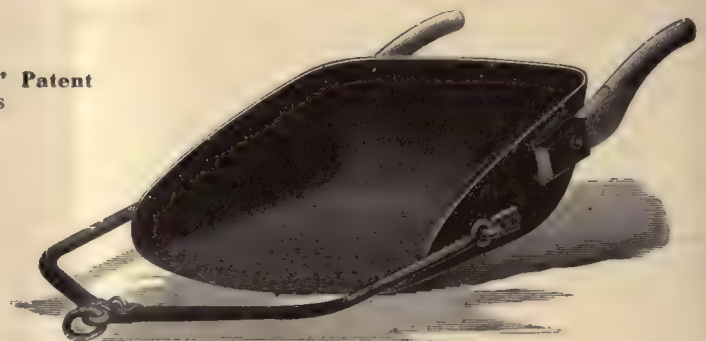
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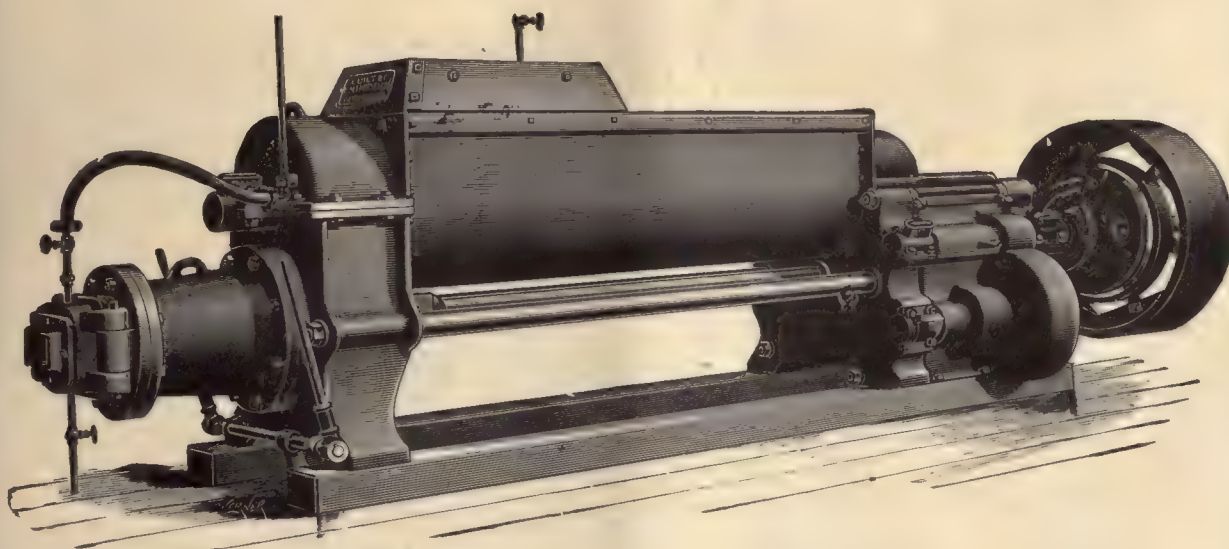
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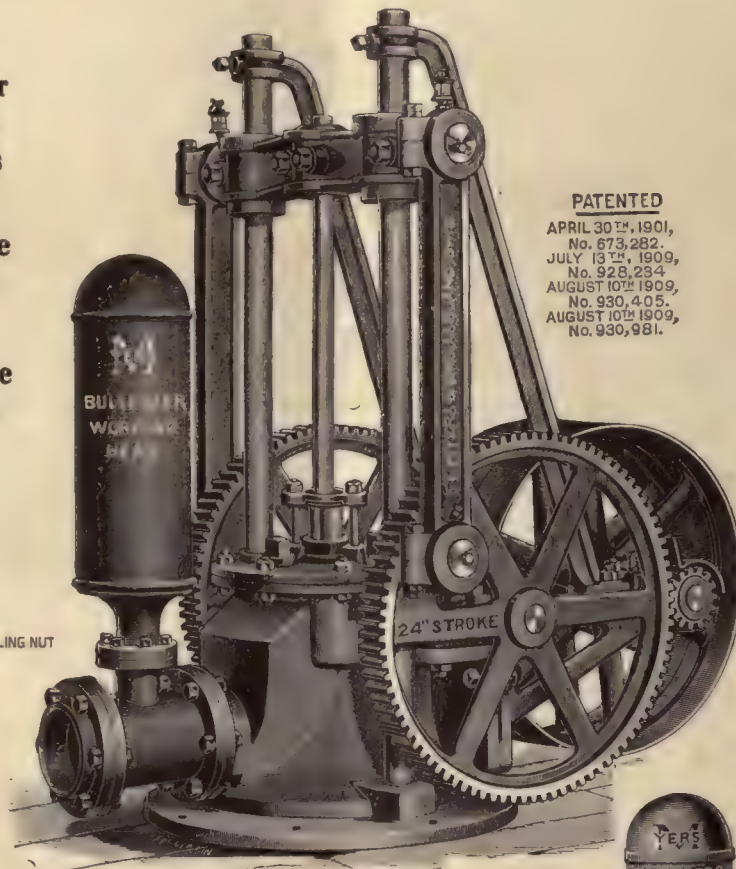
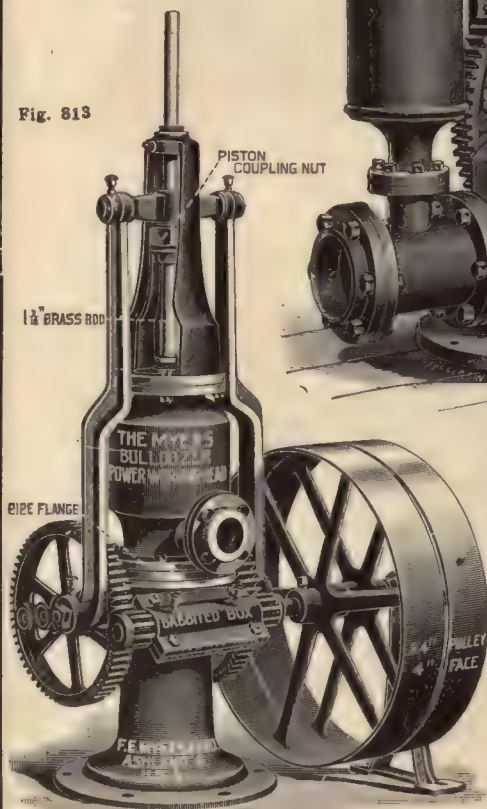
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The Myers
Bulldozer Power
Working Heads
For Deep Wells

Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches

Fig. 813



PATENTED

APRIL 30TH, 1901,
No. 673,282,
JULY 13TH, 1909,
No. 928,284
AUGUST 10TH 1909,
No. 930,405,
AUGUST 10TH 1909,
No. 930,981.

PATENTED

The Myers
Bulldozer
Power Pumps
For
Shallow Wells

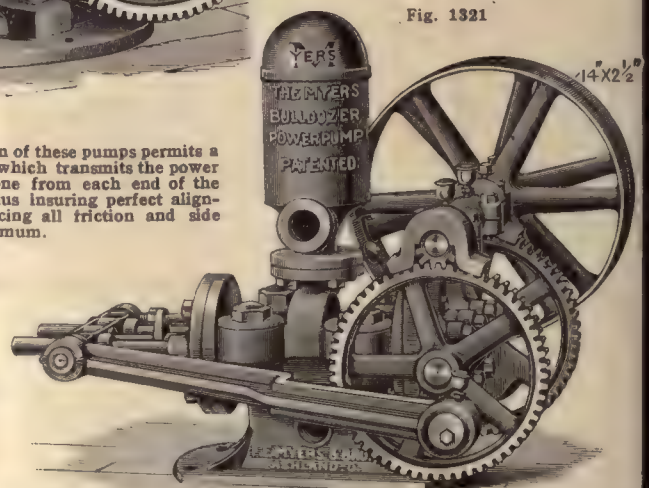
Double Acting
Length of
Stroke
5 to 20 inches

Size of
Cylinders
2½ to 6 inches

Size of
Discharge
Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

Fig. 1321

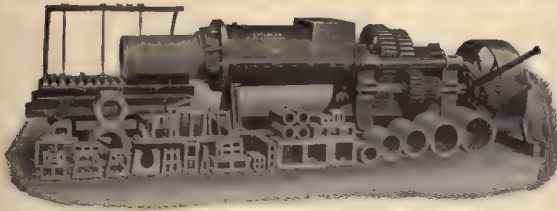


The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

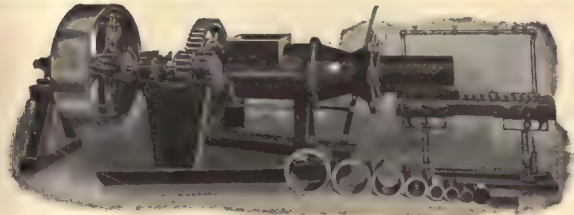
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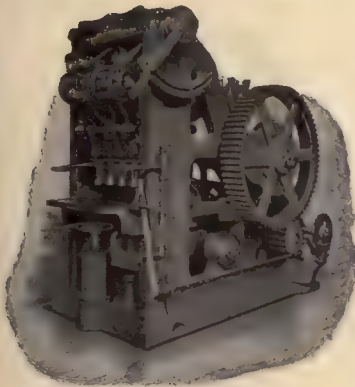
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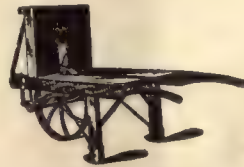
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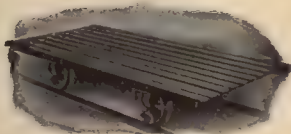
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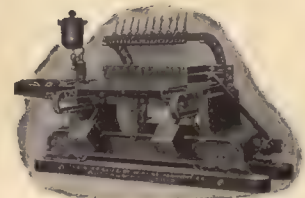
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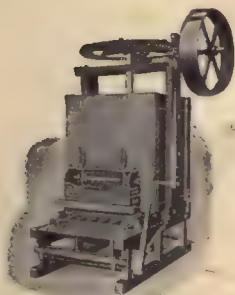
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In any location where, mounted either horizontally or vertically, the pump can be placed close to the water supply, the

“American” Centrifugal Pump

will develop higher efficiencies than any other type of pump except the compound plunger pump connected to a compound condensing engine with Corliss valves. But a plunger pump equipped in this manner is **mighty expensive** to install, will require many times as much expense for **attendance** and, owing to its complicated mechanism, will require many times as many **repairs**.

Figure all these expenses for a period of years and the “American” Centrifugal will prove the more economical installation in every instance.

All centrifugal pumps look much alike from the outside but differ materially in interior construction, and it is the design of the water-ways and refinement of the flow-lines that are the most important features of the pump.



All the Gold Medals given to centrifugal pumps at the Alaska-Yukon-Pacific Exposition at Seattle in 1909 were awarded to **“American” Centrifugals** for the reason that the **flow-lines** were refined to a degree that the judges were compelled to recognize their superiority.

In the “American” Centrifugal there is no sudden change of direction of water in passing through the pump—just an easy forward flow in curves of constantly increasing radius and the impeller is adjusted to the casing with precision, preventing back-flow.

These features give “American” Centrifugals efficiencies of 60 to 80 per cent under actual working conditions and they are guaranteed to more than equal the best performance of any other pump of their type.

But it is not only in efficiencies, but cost of maintenance and repairs, that “American” Centrifugals excel. The main bearings are oiled with ring oilers from oil cellars and, once the pump is in operation, it requires no attention except to drain off the refuse oil and refill the cellars every week or ten days.

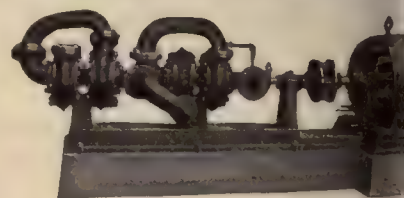
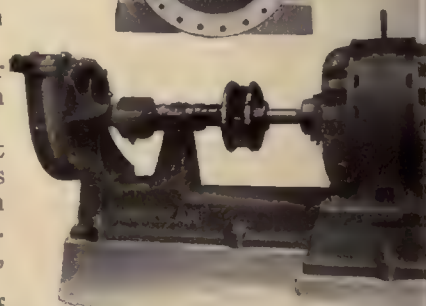
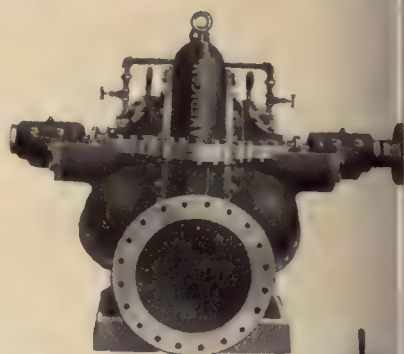
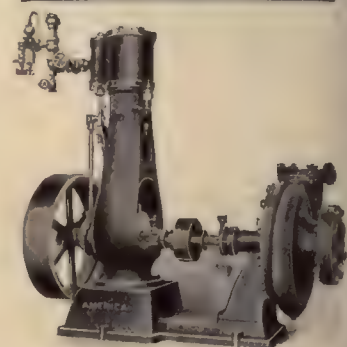
“American” Centrifugals are made in both horizontal and vertical types, in any size, in any number of stages and equipped with any power.

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The Wonderful Sale of a Simple Car

The Overland—the Simple and trouble-proof Overland—now commands a larger sale than any other car in existence. And the demand is now growing five times faster than it ever grew before.

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The second year's sale of the Overland was ten times as large as the first. And this year's orders are already five times as large as last year's.

Now we are making 140 Overlands daily. Last year at this time our output was from 20 to 25.

Two years ago we had one little factory. Today we have five factories, employing 4,500 men.

But never before has the demand increased as fast as it is increasing today. The more cars we get out the greater the call, for the Overlands sell themselves.

The Reasons

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And it has the pedal control. Push a pedal forward to go ahead, and backward to reverse. Push another pedal forward to get on high speed. It is as simple as walking—so simple that a child can master the car in ten minutes.

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The \$1,000 Car

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It is not under-sized, not under-powered, like the usual low cost car. The wheel base is 102 inches.

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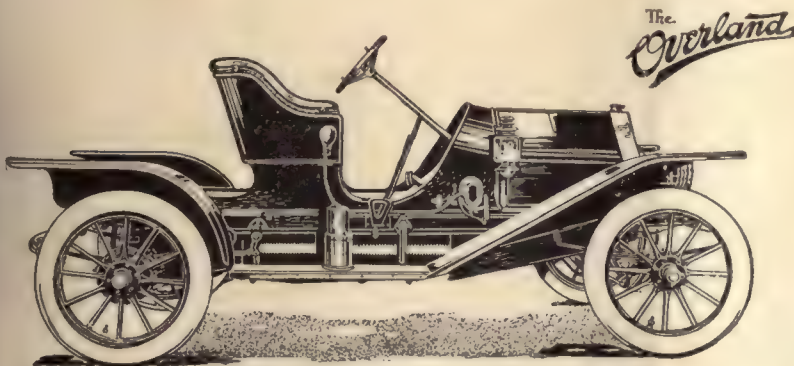
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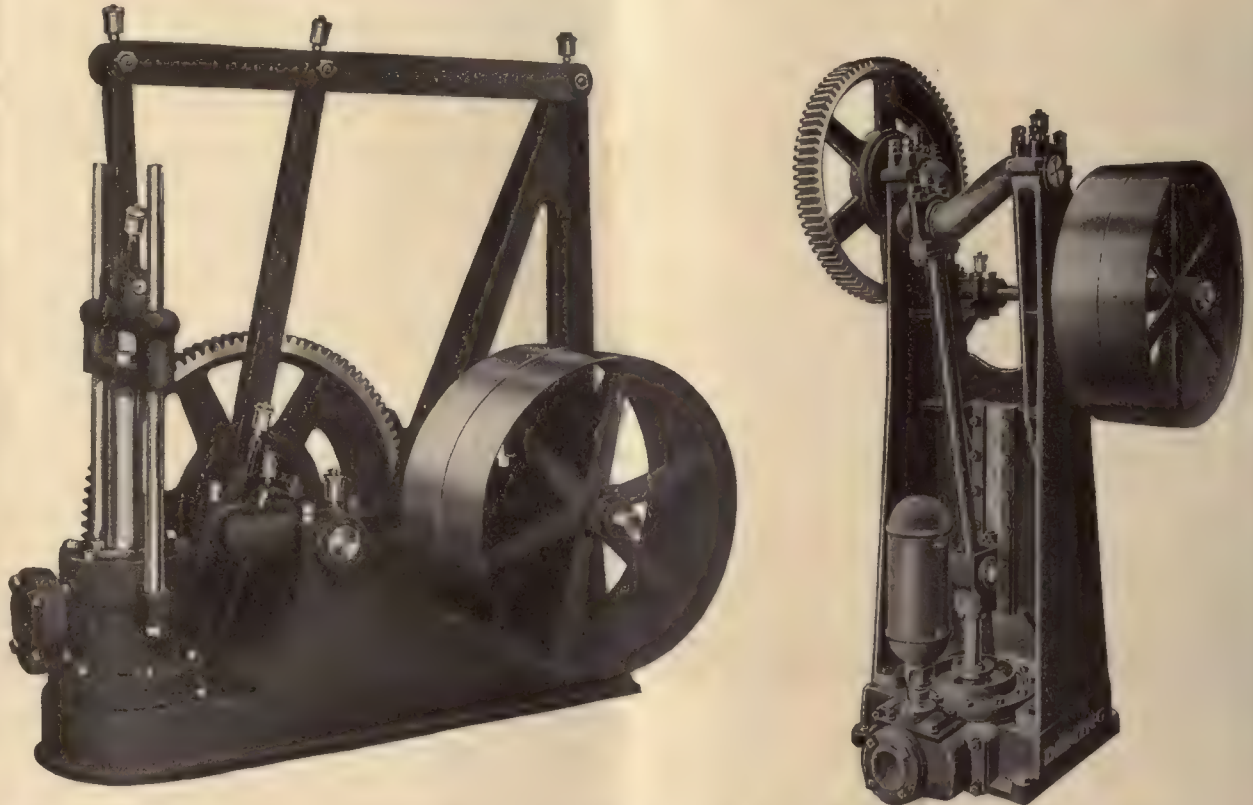
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Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

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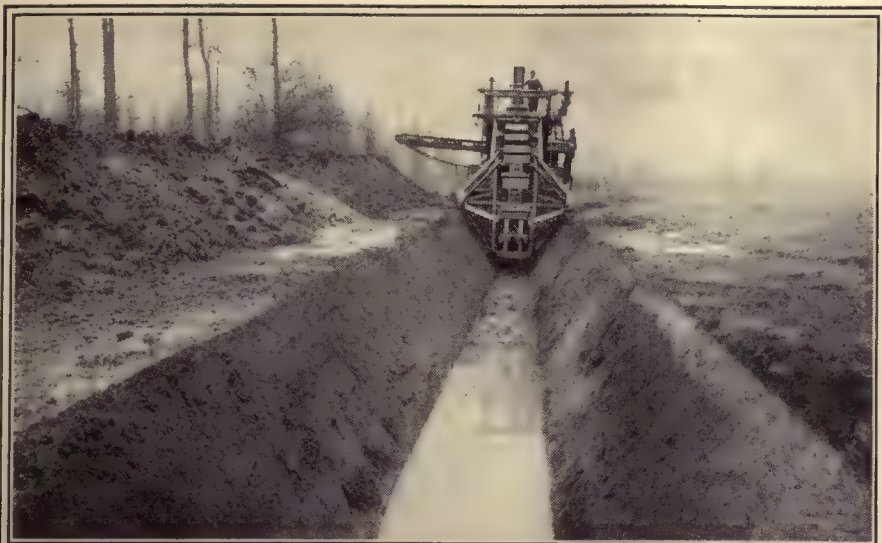
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Ditch being dug by the Austin Drainage Excavator, 1½ to 1 Slope

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Requires no water for its operation, other than for boiler. Hence, excavation may be begun at mouth of ditch and proceed towards its source. This permits land along lower stretches of ditch to be drained and put into crops while upper stretches are still being excavated.



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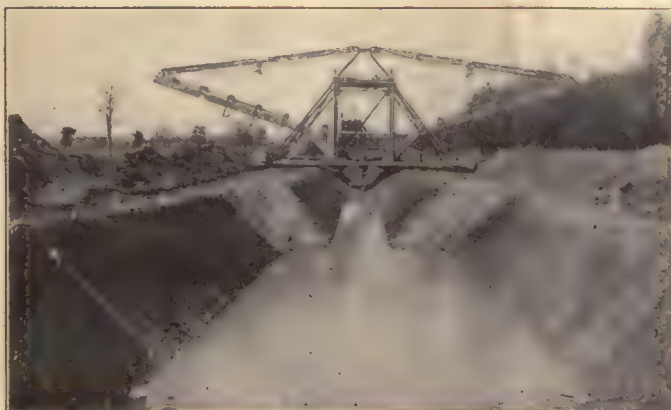
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CHICAGO, AUGUST, 1910

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In any location where, mounted either horizontally or vertically, the pump can be placed close to the water supply, the

"American" Centrifugal Pump

will develop higher efficiencies than any other type of pump except the compound plunger pump connected to a compound condensing engine with Corliss valves. But a plunger pump equipped in this manner is **mighty expensive** to install, will require many times as much expense for **attendance** and, owing to its complicated mechanism, will require many times as many **repairs**.

Figure all these expenses for a period of years and the "American" Centrifugal will prove the more economical installation in every instance.

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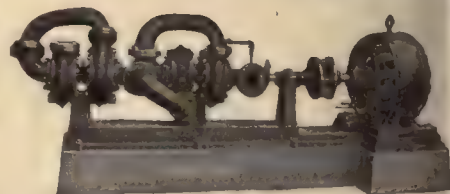
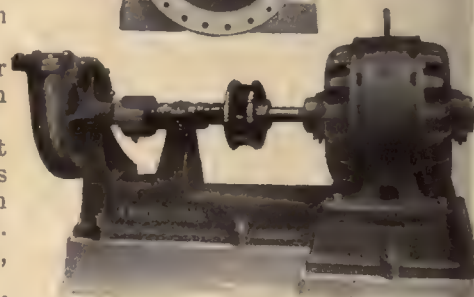
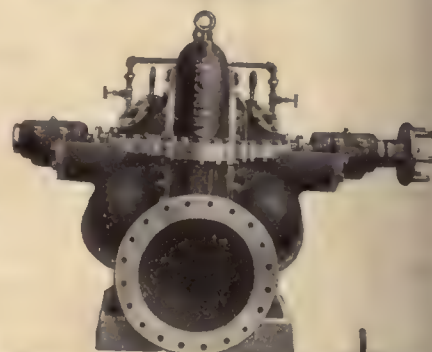
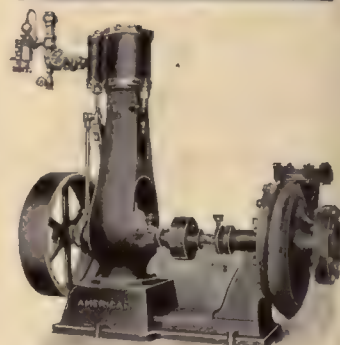
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Myers Power Pumps

Working Heads, Pumping Jacks, Cylinders, Etc.

PATENTED

The Myers
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Length of Stroke
5 to 24 inches

Size of Discharge
Up to 6 inches

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The Myers
Bulldozer
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Double Acting
Length of
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5 to 20 inches

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Size of
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Up to 4 inches

Capacities
600 to 7200 Gallons
per Hour

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APRIL 30TH 1901,
No. 673,282.
JULY 13TH 1909,
No. 928,234.
AUGUST 10TH 1909,
No. 930,405.
AUGUST 10TH 1909,
No. 930,981.

Fig. 813

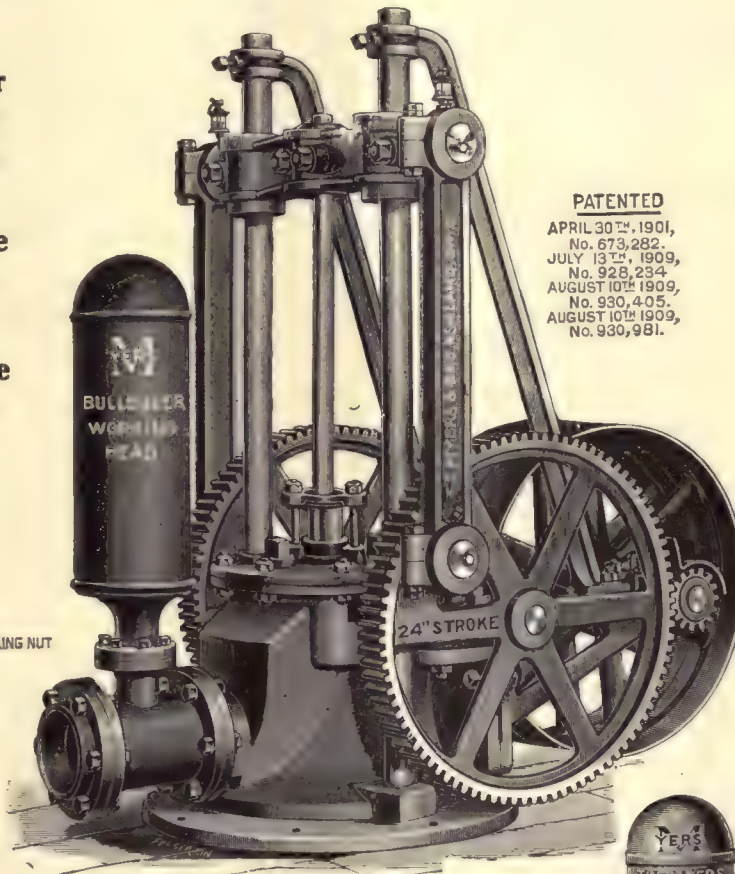
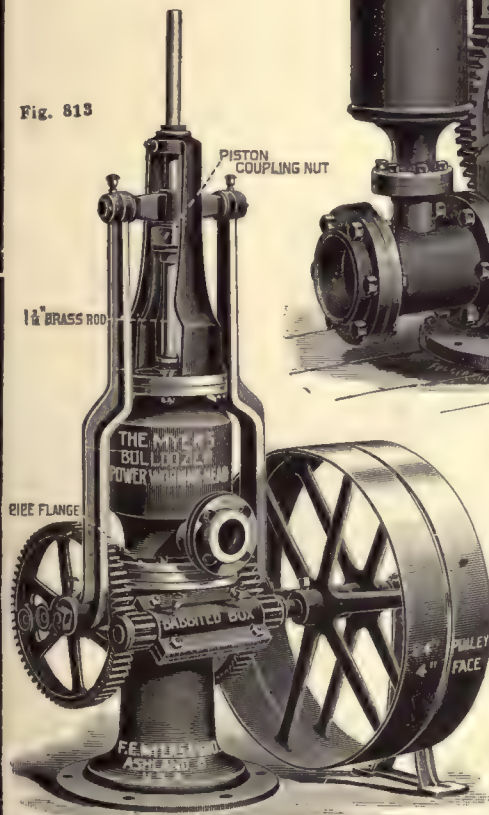
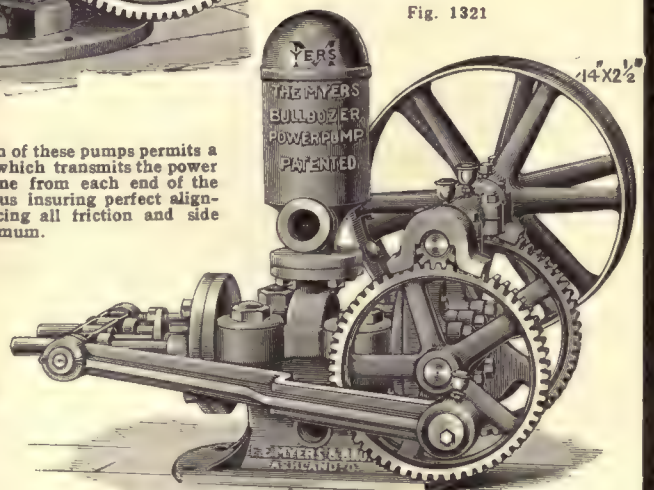


Fig. 1321

The construction of these pumps permits a double gearing which transmits the power in two lines—one from each end of the same shaft, thus insuring perfect alignment and reducing all friction and side strain to a minimum.

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Why?

Not because he likes to spend more money.

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Think that over.

It means something.

• • •

If a new car costs \$1500, and one year's repairs cost \$500, the price of that car is really \$2000.

If this \$2000 car is in the repair shop, getting fixed up, three days a month, its owner is losing one-tenth of its service, or \$200.

This car, therefore, stands its owner \$2200 the first year, although it cost only \$1500 to begin with.

• • •

In using this cheap little car its owner never knows when something is going to break and leave him stranded miles from home.

Being a cheap car, it can't climb hills like a good car, it lacks the speed of a good car, it hasn't the size, style and beauty of a good car, and wherever the owner goes with it, it advertises him as a *cheap* buyer.

That's why no man ever buys one of these cheap little cars a second time.

• • •

If a car isn't worth buying a second time, it *isn't worth buying at first*.

And the buyer who recognizes that fact before he buys any car at all, saves himself much expense, much disappointment, and much annoyance.

• • •

If you are planning to buy a motor car, read every word of this advertisement.

• • •

We have made motor cars continuously since 1896. Mr. Winton made and sold the first gasoline car produced in America. He has made and sold more first-class cars than any other single manufacturer. And we have on our books the names of men who have bought as many as six or eight of our cars. One buyer, Mr. L. R. Speare, president of the American Automobile Association, has owned and used 16 different cars of our manufacture.

It is because Winton cars are right in the first place—right in material, workmanship, power, style, beauty and cost—that once a man buys a Winton he will never be satisfied with any other make.

• • •

One reason why this is true is that the Winton car stands up under hard use with a smaller repair expense than any other car on the market.

Sworn testimony of 20 Winton owners (we send you their names and addresses upon application) show that 20 Winton cars traveled 184,190 miles on \$142.43 repair expense.

That distance is more than seven times the distance around the earth at the equator.

And each car's average repair expense for 1000 miles was 77 cents.

That's a world's record that touches the pocket book of every automobile owner.

Compare that record with the expenses of the owners of other cars—right in your own neighborhood.

• • •

This wonderfully low expense record of Winton cars shows that they are right in the first place—right in material, workmanship, power, quality, performance, right in everything that makes an automobile worth while.

• • •

Because they are right in the first place, Winton cars stand up longer than any other car on the market.

There are any number of Winton cars made as far back as 1900 still doing daily service in this country.

No other maker has a record to compare with the Winton record.

• • •

And because Winton cars stand up indefinitely, and run at low expense than other cars, it follows that a Winton car is always a good purchase, no matter how old it may be.

For the quality is in the car itself, and it stays there.

If the quality isn't in the car in the first place, you can't put it in. And that's why the buyer of a cheap little car never buys one of the same make a second time.

Because it depreciates so quickly that what little merit it originally possessed is soon gone, and the car is worthless.

• • •

We realize that there are many buyers who hesitate to put into their first car as much money as we get for our 1910 model—\$3000.

But we want the trade of these buyers just the same, because we know that once they become acquainted with Winton merit they will be the best salesmen for Winton cars we could get.

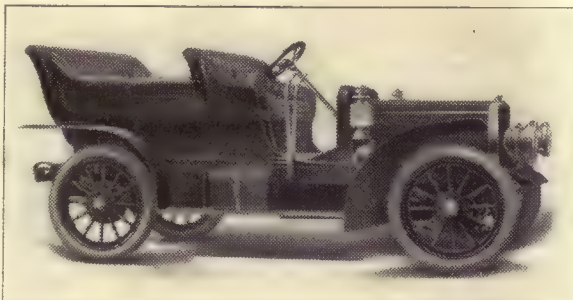
So we have devised a plan where the man who doesn't want to spend \$3000 can still get a Winton car, and be in the class of high-grade buyers and satisfied owners.

• • •

This is the plan.

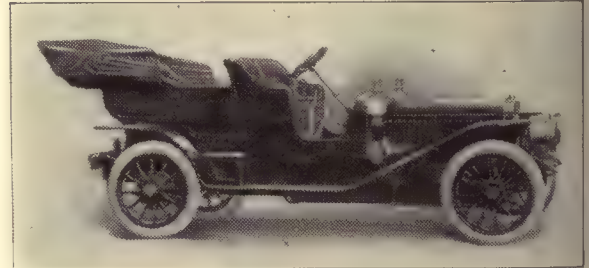
Some of our buyers want a new car every year—in order to have the very latest style of body, the latest thing in fancy trimmings, and the like.

These buyers turn over their used cars in part payment for new cars.



WINTON TYPE X-I-V.

Four-cylinder, 30 H. P. motor. $4\frac{1}{2}$ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Semi-floating-type rear axle. Forged-steel front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on ball bearings. 34×4 -inch tires. Wheel base 104 inches. Gasoline tank, 22 gallons. Five-passenger body. Original price, \$2500. Bargain price, \$700 to \$950.



WINTON SEVENTEEN.

Self-cranking, six-cylinder 48 H. P. motor. $4\frac{1}{2}$ inch bore. 5 inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magneto and storage battery. Mechanical force-fed lubrication. Multiple-disc clutch and three-speed selective-type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating-type rear axle. Channel steel front axle, with manganese bronze heads. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearing. 34×4 -inch tires in front, $34 \times 4\frac{1}{2}$ -inch tires in rear. Wheel base 120 inches. Gasoline tank 22 gallons. Five-passenger body. Original price, \$3000. Bargain price, \$2000 to \$2500.

Against Loss in Buying a Motor Car.

In the past it has been our custom to sell these used cars to city buyers "just as they stand."

But we have changed our policy—in order to get your trade.

• • •

We take these cars into our factory, replace worn parts, tune up the car to top-notch running condition, revarnish the body (sometimes giving it an entirely new coat of paint), and offer this car to you at exactly what it costs us.

This policy puts you in possession of a high-grade car at an exceptionally low price and makes you an enthusiastic advertiser of Winton cars.

• • •

And remember this: If you ever buy a Winton car from the Winton Motor Car. Company, and it is not exactly as represented, we give you your money back without bickering or delay.

YOUR MONEY BACK is something no other automobile maker offers. We make the proposition because we know we have the best cars that skill and experience and facilities can produce.

• • •

Look over the bargains offered on this page. Pick out one that appeals best to you, and write us about it.

This involves no obligation on your part whatever.

We will write you, describing the car in detail, tell you what it is in the way of top, glass front, speedometer, if any (some cars are sold without these equipments), and will make you a rock bottom price that will interest you.

• • •

And note this: You are not obligated in any way. We never pick up a car to a prospect and try to force him to take it, when he has only asked for information.

The Winton Motor Car. Company doesn't do business that way.

If after we have told you exactly what we have, you decide to look the car over, we will arrange for a demonstration before you put down a cent. Even then there is no obligation on your part. You needn't buy at all unless you are ready to buy and unless you are satisfied. And even if you do buy, remember we say: "**Your money back if the Winton car is not as we have represented it.**"

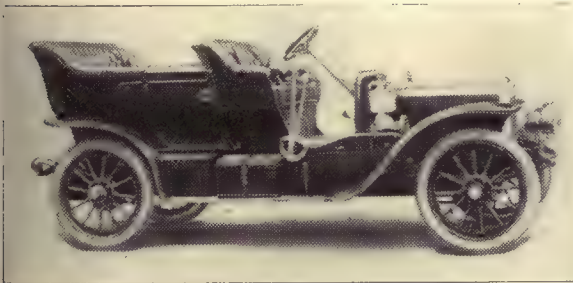
• • •

Look over these bargains and write us today. We urge prompt action because our stock is limited.

THE WINTON MOTOR CAR. CO.

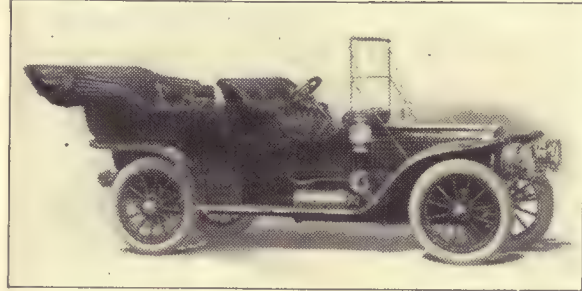
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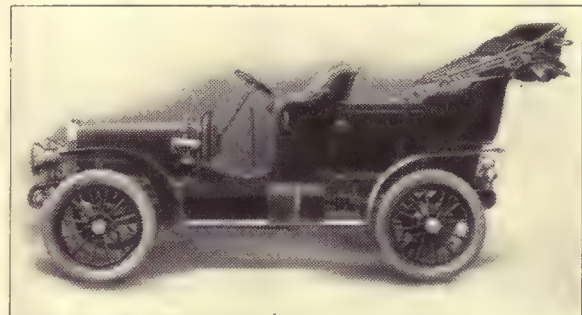
WINTON MODEL M.

Four-cylinder, 40 H. P. motor. 5 inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Multiple-disc clutch and four-speed selective-type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4½-inch tires. Wheel base 112 inches. Gasoline tank, 22 gallons. Seven-passenger body. Original price, \$3500. Bargain price, \$1100 to \$1400.



WINTON SIX-TEEN-SIX

Self-cranking, six-cylinder, 48 H. P. motor. 4½ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magneto and storage battery. Hancock mechanical oiler. Multiple-disc clutch and three-speed selective-type transmission. Clutch and transmission run on ball bearings. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 36x4½-inch tires. Wheel base, 120 inches. Gasoline tank, 22 gallons. Seven-passenger body. Original price, \$4500. Bargain price, \$1600 to \$2000.



WINTON MODEL K.

Four-cylinder, 30 H. P. motor. 4¾-inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Three brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4-inch tires. Wheel base 102 inches. Gasoline tank, 15 gallons. Five-passenger body. Original price, \$2500. Bargain price, \$600 to \$800.

The Winton Motor Car. Co.

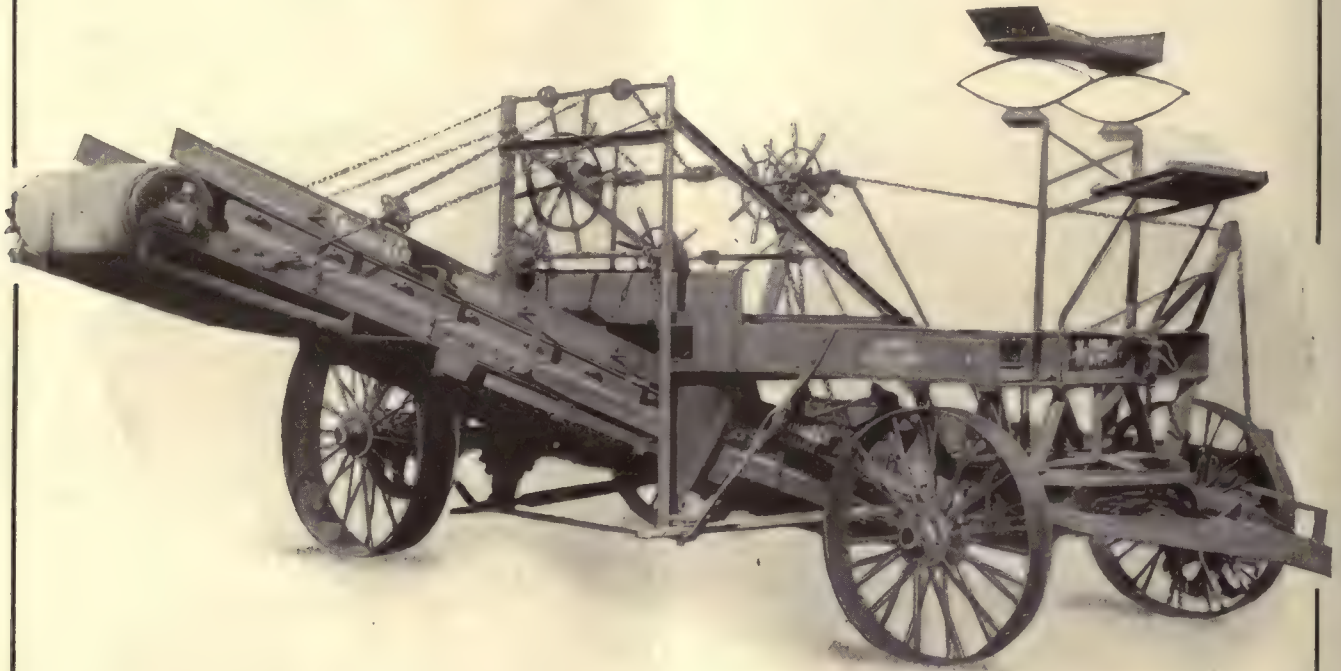
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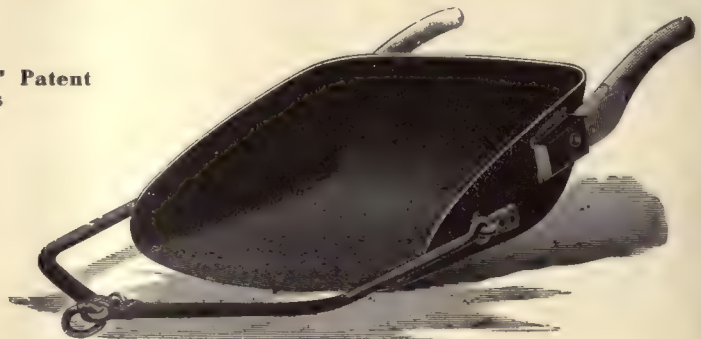
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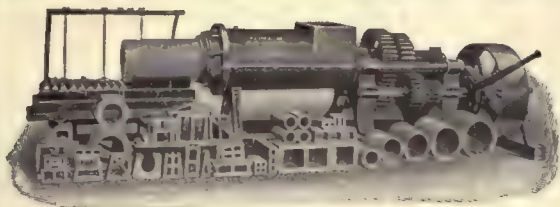
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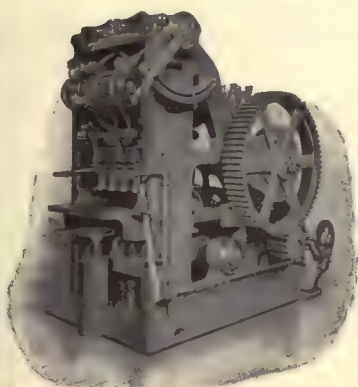
Drag Scraper



Centennial Auger Machine



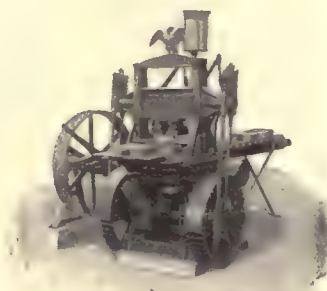
Mascot Auger Machine



Dry Press, 5 styles



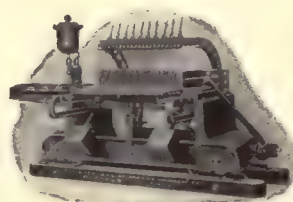
Wheelbarrows and Trucks



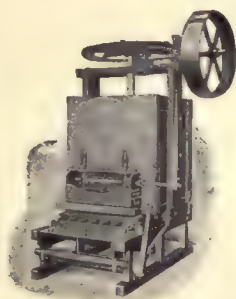
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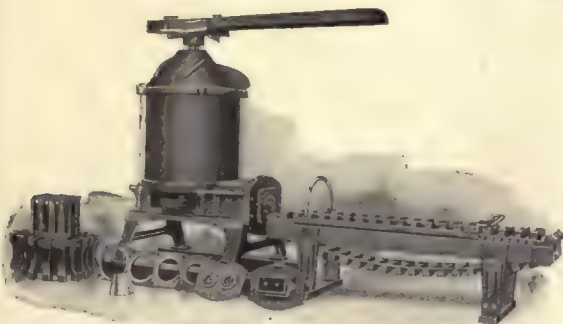
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Mch. Co...Bucyrus, Ohio



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(Patented all over the world)

This appliance is extremely simple in its manipulation—requires no experience—is easily operated by an unskilled workman or youth.

This device is particularly valuable in removing weeds from reservoirs and irrigation ditches. It is also used for clearing rivers, water trenches, fishing and ice ponds, lakes, bathing places, drives for duck shooting and for clearing muddy streams by cutting away the weeds which retain the mud.

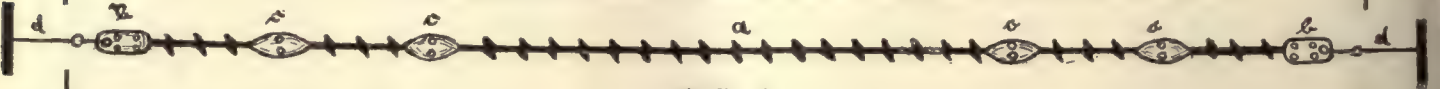


FIG. 1

The constituent parts are: (a) Weed Cutting Saw. (b) Clamps for coupling the Saw to the draw-rope *d*. (c) Torpedo shaped Sinkers. (The draw-ropes and handles, viz. a stick, being obtainable anywhere, are not supplied with the Weed-Cutter.)

The photographs shown on another page in this issue will illustrate a pond before and after using the weed cutter. This pond is 33 yds. in breadth and was cleared by two men, one on each side of the water, in ten minutes.

The saw is sold in lengths of 10, 15, 20, 25 and 30 yds. and up to 100 yds. on special orders.

Price (complete with four Sinkers, Clamps and Screwdriver for 10 yard lengths of saw) \$20.00 each set. The price on saw alone is \$1.50 per yard.

For full information and literature address

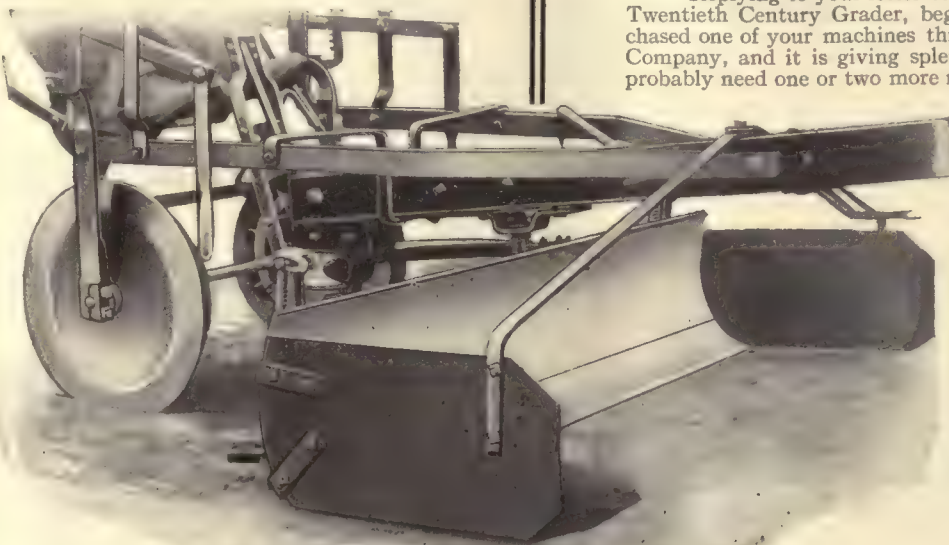
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Blade lifted easily with lever.
Wheels always have level surface to run on.
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All steel—strong enough for four horses.
Carries no extra weight.—GUARANTEED.



BITTER ROOT STOCK FARM

The Baker Mfg. Co., Hamilton, Mont., May 17, 1910.
Fisher Bldg.,
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Gentlemen:—

Replying to your letter of May 12th, relative to your Twentieth Century Grader, beg to say that we have purchased one of your machines through the Valley Mercantile Company, and it is giving splendid satisfaction. We will probably need one or two more machines for next year.

Yours truly,
P. J. Shannon, Mgr.

Same Machine for

DITCHING,
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Free catalog, write

BAKER MFG. CO.

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This machine is carried in stock
in all large cities and is sold
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SUPERIOR DRILLS are Used and Appreciated by Good Farmers the World Over

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Parlin & Orendorff Imp. Co.,	Portland, Ore.
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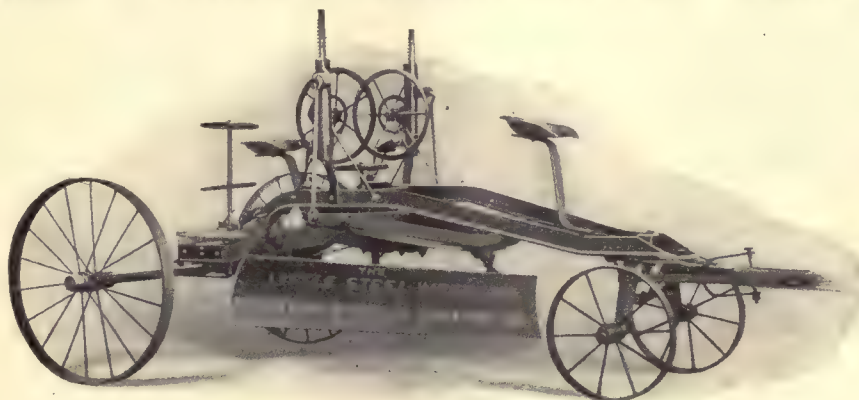
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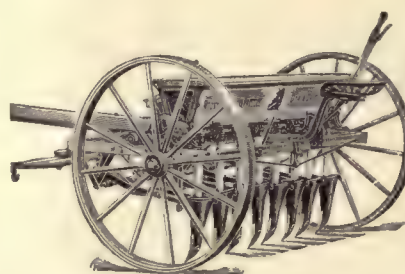
There is nothing made so adaptable for out-door sleeping. It is practical, light, portable, bug proof, fly proof, sun and shower proof. Just the thing!

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HAMMOND, IND.

They will Send You Their Illustrated Catalogue.



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HOOSIER HOE DRILLS HAVE BEEN STANDARD
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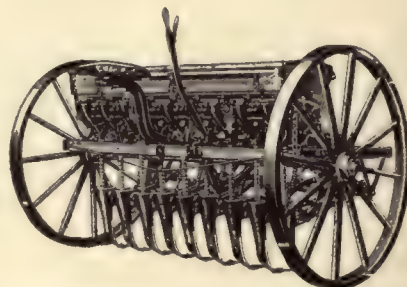
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Twenty-fifth Year

THE IRRIGATION AGE

VOL. XXV

CHICAGO, AUGUST, 1910.

No. 10

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION

THE IRRIGATION ERA

ARID AMERICA

THE DRAINAGE JOURNAL

MID-WEST

THE FARM HERALD

IRRIGATION AGE COMPANY,

PUBLISHERS,

112 Dearborn Street,

CHICAGO

Entered as second-class matter October 3, 1897, at the Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

Machinery Men at the National Irrigation Congress.

Additional interest in the National Irrigation Congress is attached to the fact that the manufacturers and jobbers of irrigation and farm machinery and farm supplies will probably be represented in an exposition at Pueblo. Col. E. W. Fleming, of Kansas City, fourth vice-president of the Congress, started the ball rolling, and Director Markham conceived the idea of bringing these forces into direct relationship with the Congress through the exposition. The Implement Dealers' Club of Kansas City will doubtless be represented and efforts are being made to interest manufacturers and jobbers all over the country. These interests are vitally concerned in the development work of the West, and in no other way can they get into closer touch with the men who are working out irrigation problems than in the manner proposed. An exposition of machinery especially adapted to irrigation and general farm work would add tremendously to the interest of the exposition, and certainly result in great future benefit to the manufacturers themselves.

Secretary Ballinger at the Congress

There seems to be some doubt as to whether Secretary Ballinger of the Interior Department will be present at the Irrigation Congress at Pueblo. Press dispatches state that he received a formal invitation early in August but that his reply did not contain the assurance that he would attend. Mr. Ballinger stated that as this was the first official notice that he had received of the meeting of the Congress he was not certain that he could arrange his affairs to

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Official organ Federation of Tree Growing Clubs of America. D. H. Anderson, Secretary.

Official organ of the American Irrigation Federation. Office of the Secretary, 212 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 25 years old and is the pioneer publication of its class in the world.

allow him to be present, owing to the late date on which he had been invited. There certainly could be no intention on the part of the officers of the Congress to embarrass Mr. Ballinger by extending a formal invitation to him at a late date, and it is to be hoped that he will not fail to attend. The present agitation of conservation matters will bring before the Congress questions of the greatest importance to the Interior Department, and there is nobody who can speak with the authority or conviction that Mr. Ballinger can. While President Taft's policy will be most vigorously supported by men of influence, his absence from the convention floor would be counted as a distinct disappointment to every friend of conservation and of President Taft.

The Men Who Will Spend Twenty Millions Public Money

Major C. W. Kutz, of the United States Army, has been appointed by President Taft on the board of United States Engineers which will make recommendations as to the expenditure of the \$20,000,000 to be devoted to reclamation work. Major Kutz, who was stationed at Seattle, attended the first meeting of the board at Washington on July 20. As the preliminary work of the board will require several months the engineering work of the Government in the Puget Sound district will be under Captain Arthur Williams, of Portland, his assistant. The bill appropriating the \$20,000,000 for reclamation work provides that before any expenditure of this sum be authorized it must be passed on by this board. Its recommendation is to be made to the president who must approve it personally. The personnel of the board is as follows: Maj. C. W.

Kutz, Lieut. Col. John Biddle, of San Francisco, division engineer of the Pacific division, and Lieut. Col. W. C. Langfitt, now of Washington, D. C., but formerly located for many years at Portland. Maj. W. W. Harts, now of Nashville, Tenn., formerly was located at San Francisco for several years; Maj. Harry Burgess, of New Orleans.

**Noted Men
To Be At
the Pueblo
Convention.**

A large number of the most noted men in the country will attend the Eighteenth National Irrigation Congress at Pueblo. It is expected that President Taft and all the members of his cabinet will be present and letters have been received from many members of the United States Senate, House of Representatives, and the Governors of several States expressing their intentions of taking part in the proceedings. Theodore Roosevelt has been invited as one of the principal speakers, and it is quite certain that a large number of his influential friends and admirers will also be there. Gifford Pinchot will urge Mr. Roosevelt to accept the invitation to speak at the Congress, and he will himself champion the Roosevelt conservation policy. The mayors of every important city in the country have been invited to attend the Congress, and scores of bankers, financiers and railroad men who are deeply interested in the development of the West and the policies which govern, are expected to take an active part in the discussion of subjects to be considered. Altogether it will doubtless be the most notable irrigation congress ever held and illustrates the extraordinary interest in this great work that has seized upon the people. Conservation of our natural resources in its broadest sense is the most important subject claiming the attention and vitally affecting the interests of the people today and they are beginning to realize it. It must be a source of gratification to those far-seeing, hopeful and determined men who, many years ago, saw as in a vision the tremendous future importance of irrigation and conservation, to now see that their hopes are being realized and their predictions verified.

**American
Farmers
Leaving
Canada.**

It is stated on the authority of the officials of the Reclamation Service that thousands of American farmers who went to Canada are again turning their faces homeward. Many farmers who sold their holdings in this country to try their fortunes in Canada, have already arrived at their former homes and many are expected to follow soon. It is said that practically every American farmer in the neighborhood of Alberta, where the Canadian Government maintains an irrigation project, is dissatisfied with conditions and wants to get back home.

The principal crops raised there are alfalfa and winter wheat, and there is much uncertainty as to these. The climate is extremely cold, heavy snowstorms falling in September and October last year adding to the general discomfort and discontent. It is estimated that 15,000 settlers have returned from Canada during the past nine months, and the great majority of these base their principal objection to the country on the form of the Canadian Government. Free born Americans do not take kindly to Canadian or other foreign laws, and homesickness quickly strikes them when they get beyond the boundaries of their own country.

The turning homeward of the tide of immigration that has flowed northward during the past few years is no surprise to those who are familiar with the conditions in

this country. With the vast tracts of fertile arid lands now being developed along broad and intelligent lines by the best government on earth, located near the big markets in the biggest country in the world, with a people and climate unsurpassed, the farmer who leaves America to seek his fortune in Canada is making a great mistake and will soon regret it.

**Dangers
in the
District
Irrigation Law**

Every State having the district law should have a competent State administration and a code of irrigation laws which will enable the officers in charge to see to it that the district business is safe. The early California experience has been repeated in Colorado. It would seem that Colorado has adopted much or questionable value from California and that it has not accepted much that is good from other states. The Wright District Law of California was worked to the limit. Boded indebtedness piled up until the situation seemed hopeless. It was hopeless. An attempt was made when the seriousness of the situation was fully realized to have the law declared unconstitutional. California has no administration that can pass on the legality or feasibility of irrigation works and plans for irrigation districts. Colorado is in much the same position. Wyoming has adopted the district law with some changes and unless all signs fail trouble will occur in that state.

The great difficulty with the law is that some speculator will buy up lands and then vote favorably for a district. In Wyoming the state engineer must pass on the feasibility of the plans for reclamation. There is nothing to force the promoters of the district to carry out these plans. There is nothing to protect the prospective settler. It is easy for the promoters to prepare plans that are first-class in every detail. It is easy for them to place lands on the market at \$30 and then add \$20 for water rights when the lands might have been bought in the first place for \$2 per acre and the irrigation system built for at least \$20 per acre. This kind of business always reacts.

For this reason we hold that an irrigation district should not be possible except where the lands are in private holdings and where these holdings are small comparatively. The district law should never operate except where competent public supervision of plans is provided. This public supervision should go further. The money raised by a bond issue should be placed in the hands of some public officer or at least subject to the examination of such an officer. The public should exact a bond or some kind of security from those who are responsible for the completion of the irrigation system so that the plans as approved may be carried into effect. There should be some means whereby the promoters, if such exist, will be compelled to dispose of lands and water rights at a price that would compare with real values. The prospective settler should have some protection.

**Colorado
To Help in
Arid Land
Development.**

A campaign of colonization directed by the State officials of Colorado, now under way, promises to be of the greatest benefit to that State. Its objects are to bring farmers into the State and to protect their interests by helping them to choose desirable locations and to guard them against mistakes

which strangers in any strange land are likely to make. The active work of the campaign is under the direction of Alfred Patek, State Commissioner of Immigration. Mr. Patek is a man of great resources and energy, and already, within the few weeks since the organization of the campaign, his work has begun to show fine results.

Colorado has about 3,000,000 acres of irrigated land and as much more irrigable, but undeveloped, a total of nearly 6,000,000 acres which can be brought under the plow and made highly productive. There are yet about 13,000,000 acres of government land, arable and open to entry, but in spite of this fact and the rapid advance of agriculture in that State during the past ten years, large amounts of agricultural products are shipped in every year. Mr. Patek says that last year the imports to Colorado were valued at \$32,000,000, every dollar of which should have been raised on the farms and orchards of the State.

Colorado still owns about 3,000,000 acres of school land, some of it of the very best class. These lands are sold at public auction, the last sale on July 5 realizing more than \$300,000. The purchaser pays down 10 per cent and the remainder in installments for 18 years. Some of this land brings as high as \$60 per acre, while other tracts are selling as low as \$4.50, the average being about \$12.

The State will endeavor to induce practical farmers to settle on the irrigated lands, buy the school lands and make their permanent homes in the State. Settlers on the Carey act projects will be protected and the State will see to it that purchasers get back their money in case of failure to receive water at the proper time. New farmers who come into the State will be looked after as long as they remain, or until they are entirely independent, and every means possible will be adopted to get them started right and to help them to become prosperous and contented.

Water in the Timber Country.

We trust that it will not be deemed impertinent to ask why it is that we no longer hear anything about the arguments of the Forest Service relating to the conservation of moisture by timbered areas? Evidently this theme is no longer considered as furnishing a basis for the kind of advertising that the Forest Service desires. We are informed that it was Mr. Newell, the Director of the Reclamation Service, who first gave Mr. Pinchot the tip that this subject was safe and would enable the Forest Service to get some following. It was played with for a long time. Mr. Pinchot never lost an opportunity to try and scare the people concerning the dwindling water supply as the timbered areas disappeared. Facts are against him, however, and unfortunately for his crusade, they have been made public. Engineers who know the most about the subject are lined up solidly against the theory. We are told that Mr. Pinchot feels somewhat disgruntled towards Mr. Newell for having given him advice that appears unwise and without firm foundation in truth. The incident is interesting at the present time. It illustrates how anxious Mr. Pinchot has been for material for advertising. For anything that seems to threaten life, liberty and the pursuit of happiness of the people, he has been able to find a remedy in some forestry antidote. He has been able to keep himself in the limelight and by deceiving readers as to his actual accomplishments, he keeps them fully informed as to his theories and his "reform" policies. We ask those who believe in Mr. Pinchot and who will not

undertake any investigation which will show them the truth, what kind of government would we have if every officer would spend his time and the public funds given in his charge for public work in advertising himself and in placing before the people his personal views and the policies he has accepted? Every public officer doubtless has theories and ideas that he would like to see the general government accept. The officer having the largest appropriation and the most time to exploit his ideas would soon dominate. The administrative department would soon over-ride the legislative department and policies would originate by command of executive officers and not come from the people or their representatives in Congress. If those who blindly follow Mr. Pinchot, believe in his theories, they cannot indorse his methods. We trust that they will investigate his theories. This is all that is needed to demonstrate that these are on a par with the methods he employs.

Water Users Should Know Their Rights.

Water users and those interested in canal and ditch systems are often careless concerning rights of way. When a man obtains what he calls his water right or his permit to build a ditch, he often feels that he is fully protected and that there are no other laws that should be observed to afford full protection. A part of the proposed ditch may be on government land, a part of it may be on land belonging to the State, a part may be in a forest reserve and still another part may be located on lands in private possession. State authorities can generally give the interested party advice as to how to proceed to obtain a right of way across these various tracts of land.

The local land office will be able to furnish a pamphlet relating to rights of way over the public domain; or better still, the surveyor or engineer who laid out the ditch and who finds that it is to cross government land should make his work in the field conform with the requirements of the Interior Department so that a right of way application and the necessary maps and field notes may be furnished by him at any time. Rights of way across forest reserves should be handled in the same manner, except that more or less trouble will probably be had with the forest service. The initial right of way papers are filed with the local land office and referred to the forest service in Washington. State Land Boards generally have rules which must be followed in order to obtain a right of way over State lands.

Rights of way over lands in private possession can be obtained by the consent of the owner of such lands or without his consent by condemnation. It may be that neighbors exchange courtesies of this kind. In this case rights of way should be secured by deed and recorded, so that trouble will not be had with any later owner of the lands. Where the lands have to be purchased a deed should always pass. This deed should describe the lands necessary for the construction and maintenance of the ditch by metes and bounds. Where the landowners refuse to permit a ditch to pass through their property, or refuse to set a price or make a price that is exorbitant, a right of way can be condemned. The laws relating to condemnation are very similar in all of the States. Parties interested in looking up the law relating to this subject will generally find it in the revised statutes of the State, under the heading, "eminent domain."

So much trouble has arisen because of the failure of parties interested in ditches, canals and reservoirs to take

advantage of the laws that are framed to protect them, that all who have failed to secure rights of way and to have these rights of way properly recorded should see to it that these details are attended to at an early date. It is often much easier to settle rights of way during the early stages of development when all settlers and landowners are striving to encourage every move which will add to the prosperity of the community. Delay generally means complications and great expense. Above all things, when an agreement has been reached as to the disposition of lands for rights of way for any purpose, a deed should be immediately drawn and recorded. Deeds of this kind should only give the purchaser the right to use the land for a specified purpose and when the use fixed by the deed ceases, the land should revert to the original owner.

**Mr. Pinchot's
Water
Power
Advertising.**

The man who reads at random and never digests what he reads must be convinced that a water power monopoly is likely to develop. Mr. Pinchot, late forester of the United States, has advertised this scare very thoroughly. He is a good advertiser but his theories are generally found to be of but little value when they are analyzed or put to a practical test. He has very adroitly brought many to believe that every natural resource is liable to be monopolized. The only monopolies in the public land states are those that are fostered in some way by the national government, and Mr. Pinchot has been very active in his co-operation with such interests as have been able to help him out in his political and publicity campaigns. We have certain land grants made by Congress, which might be termed local monopolies in land. We have exchanges of scrip for land Mr. Pinchot wished in forest reserves, which are monopolies of a more dangerous kind. He did not hesitate to approve of a plan whereby a railroad secured 6,000,000 acres of scrip. He holds up his hands in holy horror when a poor homesteader violates some rule or regulation under the homestead act.

Yet this man now poses as the defender of the common people. He conjures up a new plank and calls it "conservation." He has never defined what the term means. He has embraced pure food, the white slave traffic and the water power monopoly under the one comprehensive heading. It is possible that some prophet will rise up and give us some light. Thus far Mr. Pinchot has not shown the way, yet many who read without study and who accept policies without mature reason, have accepted "conservation" as the true faith. One year it is the money question, the next year it is imperialism. Of all of the fads "conservation" is the most ridiculous. We know nothing about the scientific features of pure food and possibly less about the white slave traffic. We will make a few remarks as to the water-power scare.

Let us refer to a country that has worked out some of the material problems which Mr. Pinchot now tries to solve in his own way and for his own benefit. Egypt is old enough to furnish us examples. What about water power on the Nile? Did we ever hear of a water power monopoly there? Although the native rule of Egypt was corrupt and Turkish domination almost intolerable, each giving franchises to favorites, yet power developed from the waters of the Nile is still a drug on the market. The rapids at the first cataract would furnish power. Every farmer in Egypt needs power for lifting water from the river or canal to his fields. Gravity irrigation there is hardly known. All irrigation, practically speaking, is per-

formed by lifting the water from the channel where it flows. How is this done? There are many devices that are worked by hand power. There are many that are run by animals. There are many that are operated by steam. The coal comes largely from England. Why has the water power of the river not been developed? Simply because it would not pay. Why has the water power of our streams not been developed? Because the market for power would not justify the investment. In several thousands of years it may be that our coal supply will give out. The people then will be as much our superiors as we are the superiors of the cave dweller. They will have methods for accomplishing results necessary to the life of that age that we cannot dream of now. There will be plenty of undeveloped water power then.

We have a theory that must finally be, we believe, recognized. Resources must be controlled by the people concerned in their use. The national government should only retain control as long as no plans are submitted for a more local supervision or for actual beneficial use. If a state can administer resources in behalf of the public represented within its borders, it should be held responsible. If the community within a state organizes so as to provide proper management, the entire control should go to that community. It is easy for Congress to make appropriations. It is easy to provide for new offices and to get new officers. The necessary work of the national government has narrow limits. Because so much is being done now that has no value to the people at large, it is easy to multiply federal places. This all tends to increase the official family at Washington. The wires to many districts throughout the country are multiplied and the life of the politician is made more secure. The national government has not been able to erect buildings in Washington with sufficient rapidity to shelter the officeholders. The government is renting buildings throughout the city. The outlook for quarters for the future is not bright because the official family is very prolific. This horde of officeholders accomplishes something. If some departments were entirely obliterated and others reduced from sixty to ninety-nine per cent, the change would never be noticed by the people at large. Only the officials directly concerned, their immediate relatives and friends and their political allies would pay attention to such a reform. Each officeholder of any standing can tell you how much he is doing for the people, but upon investigation it will be found that a large part of the work is worth but a few cents when it costs thousands of dollars. It will be the purpose of the AGE to show to the reading public some of the most notorious examples of useless offices.

**What
Does
Conservation
Mean?**

We should like to review some recent history which should be kept in mind. We wish to inquire into the meaning of the term "conservation" and try to understand why the little coterie of government officials at Washington have broken away from administrative work, as prescribed by law, and have launched into politics. We only need go back a few years to find how the forest service developed. When we remember the many conventions that we attended and when we review the efforts of the forest people to get a resolution indorsing their work, we begin to see the beginning of the publicity movement.

Mr. Pinchot has been a great success as a publicity

agent. He has been able to do much himself. He has done much more through his department, and with his great appropriations for forest work he has been able to carry on an advertising department that excels anything we know of, with the possibility of some of the patent medicine companies. He has gone further. He has started societies for the sole purpose of getting support and he has worked other societies and secured their help regardless of their aims and purposes. The Daughters of the American Revolution, for instance, have been furnished with printed advertising and requested to have the same published in local papers. In the meantime the appropriations for his department have run into the millions, six and seven millions being not uncommon. Enough money has been appropriated by congress to buy all of the timber controlled by the government at the present time. The money would have been more profitably spent had the government paid a bounty on lumber imported.

Mr. Pinchot is active. He has worked so hard to convince congress that trees deserve more support than do the people of western states, that he has become intoxicated with his own success and this has led him to go a step further. He has spent his evenings and his spare time talking with companions who are in pursuit of power along other branches of government service and this little band has originated a comprehensive scheme for reserving and conserving everything. It is a plan of such breadth and depth that it embraces forests, pure food, the white slave traffic and other economic, political and social problems. By preaching continuously and by adroit manipulation of a combination of press bureaus the public has been reached very thoroughly. It would seem that some of the leading universities, where careful consideration of every problem would be anticipated, are the centers of the pro-Pinchot feeling. It is probably natural that this is true, for Mr. Pinchot has not forgotten the universities in his general advertising scheme. He has placed government money there and has employed men to do forest work, so-called, presumably as instructors, but in reality as advance agents and advertisers.

Misrepresentation and advertising not accompanied by good works can only produce effects which are slight and evanescent. If we judge Mr. Pinchot by his advertising he is a great man. If we judge him by his accomplishments he is nothing but an advertiser. Readers of the advertising may not believe this. They will not believe that Mr. Pinchot, the idol of the reformer and the martyr to a "great cause," has co-operated for years with the lumber trust, that he has worked closely for years with agents and lobbyists of various corporations and that he has exchanged privileges, that can only be granted by the government, for political support. Present conceptions of Mr. Pinchot in the public mind are based on a misunderstanding that has been created for a purpose. The truth must become apparent within the next few months or a year. An investigation as to the expenditure of government money, as to the source of revenue to run the publicity department he conducted and an inquiry into the character of his associates and co-laborers, will be sufficient to explode the bubble that has been so adroitly developed.

The conservation campaign was the last step in the advertising program. It has been a good card and it has been well played. If the people of the east or the readers of the current magazines anywhere feel that natural resources are not being used to their best advantage—if they fear that monopoly is to develop in the use of any such resource, we ask them to investigate on the ground

for themselves. We ask them not to form their final opinions because some person who is paid for writing articles for public digestion says that Mr. Pinchot's views are based on the truth.

It has been evident to many bureau chiefs at Washington that when the public domain disappears, their departments will be very insignificant, if they are not abandoned altogether. These chiefs, among them Mr. Pinchot, have consequently attempted to bring about a sentiment favorable to the reservation of lands from settlement. During the past few years every obstacle has been thrown in the path of progress that can possibly be discovered by these sub-departments. Immense tracts of lands, not valuable for forests, have been added to the area set aside for forest reserves. Thousands of acres have been set aside as coal lands, oil lands, phosphate lands, gas lands, power sites, etc. This means stagnation in development, because the general government cannot develop these resources. It means that those who already have possession of natural resources have an unrestricted market, all competition being smothered. Yet as long as these vast areas are reserved and as long as the people cannot use the resources that are locked up, these few government officers will have employment and their departments will flourish.

We simply say in conclusion that the West is getting very tired of this misrepresentation. The effects of Mr. Pinchot's campaign has been felt in every county in the West. It has brought hardships to the settler and the ranchman. It has made him guilty of a crime as soon as he made a filing on public land in compliance with existing laws. It has made him an object of suspicion and a mark for the special agent who to "make good" must prosecute some one. In the meantime the big operator in public lands is immune. He remains undisturbed. Certain scrip which is held by corporations through the activity of Mr. Pinchot is worth three and four times as much today as it was when the holders obtained it. There are six million acres of one particular brand of scrip. What a commotion there would have been had this scrip gone into the hands of some poor homesteader! It goes to the corporations, through the recommendation of Mr. Pinchot, and nothing is said. How long will these matters be concealed from the public and when will those who read and try to keep abreast of the times understand what has been going on during the past eight or ten years?

Defining Western Water Rights.

No principle develops more slowly than when it depends for recognition upon institutions which are either ignorant as to its value or where they are influenced by some precedent which under a new order of things cannot logically apply.

We are persuaded to make this statement in connection with a review of the history of water rights in the West. California first took up the problem. Because no intelligent and able leader appeared to show the way, disputes over the division of water naturally went to the courts. The courts were not trained in these matters and consequently had to do the best possible by referring to the doctrines of the English Common Law. That California court decisions have not been satisfactory is recognized so fully that no discussion of early cases need be entered into. Colorado and other States followed the California practice. No student of irrigation matters appeared in reality until Dr. Elwood Mead and his associates had in-

serted in the constitution and laws of Wyoming some provisions which have revolutionized the methods of administering streams. Regardless of his able efforts and his activity for many years, some of the principles that he deemed most important were overturned by the courts in a measure, and it has only been by a continuous campaign that these have finally been so clearly defined by statute that all who can read may understand.

One of the most important principles that must sooner or later be accepted generally, is that water is always public property and that its use only can be controlled by private parties, and that this use (commonly called a water right), belongs to the use and not to the person making the use. If the water is used for irrigation purposes it belongs to the land. If it is used for power purposes it belongs to the particular power development, and so on. Another important detail is that no right guarantees a specific volume that can be used without regard to the necessities of the community. The right embraces a maximum use which cannot be exceeded, but the actual use is limited to the volume that can be beneficially applied.

The administrative officers of Wyoming always held that water rights belong to the land for irrigation purposes and that such rights are inseparable therefrom. The plain provisions of the original law would seem to make this interpretation reasonable. However, because other States had contrary decisions the Wyoming courts followed them, and in 1904 the Supreme Court of that State declared that water rights are not inseparable from the land under the laws of the State. Some legislation of questionable value was immediately enacted by the legislature which followed, in an attempt to correct the law. This was in force for four years when the legislature of 1909 enacted the following act, it being largely a definition of a water right:

Sec. 724 R. S., 1910. A water right is a right to use the water of the State, when such use has been acquired by the beneficial application of water under the laws of the State relating thereto, and in conformity with the rules and regulations dependent thereon. Beneficial use shall be the basis, the measure and the limit of the right to use water at all times, not exceeding, in any case, the statutory limit of volume. Water being at all times the property of the State, rights to its use shall attach to the lands for irrigation, or to such purpose or object for which acquired in accordance with the beneficial use made and for which the right receives public recognition, under the law and the administration provided thereby. Water rights cannot be detached from the lands, place or purpose for which they are acquired, without loss of priority.

Sec. 725. Water rights are hereby defined as follows according to use: Preferred uses shall include rights for domestic and transportation purposes; existing rights not preferred, may be condemned to supply water for such preferred uses in accordance with the provisions of the law relating to the condemnation of property for public and semi-public purposes. Such domestic and transportation purposes shall include the following: First, Water for drinking purposes for both man and beast. Second, Water for municipal purposes. Third, Water for the use of steam engines and for general railway use. Fourth, Water for culinary, laundry, bathing, refrig-

erating (including the manufacture of ice), and for steam and hot water heating plants. The use of water for irrigation shall be superior and preferred to any use where turbine or impulse water wheels are installed for power purposes.

The practice of the state administration has been uniform with the above law since the original statutes were enacted in 1891, regardless of court interpretation. This is the case, because until the case was handed down by the court, the law was construed to embrace the principles now more specifically defined, and immediately after the decision was made by the court, the legislature enacted a law which gave some temporary relief.

We have been led to study these matters because our attention has been called recently to a court decision that discusses fundamental principles in such a broad and comprehensive way, that we believed a detailed investigation as to the birth and rise of modern irrigation law and administration would be of value. The case we refer to relates to the adjudication of water rights of Salt River in Arizona. The action was brought by one water user against nearly five thousand others, and the United States intervened owing to the fact that the Reclamation Service is building a great irrigation system to divert water from the stream. We regret that we cannot publish this decision in full. We will quote Judge Kent's discussion of principles, which show thorough study and which we are satisfied is the best presentation of these important doctrines that has thus far been made by any court.

"The doctrine of riparian rights does not obtain in Arizona. The right of the owner of land to divert from a non-navigable stream the flow of the water therein and to apply the same to beneficial use upon such land, is and always has been recognized in this Territory. Such diversion and use is termed an appropriation of water. Whatever may be the steps necessary to take to initiate such a right or to evidence the intent to initiate it, the appropriation itself only becomes complete and vested when the water is actually diverted from the stream and placed to a beneficial use upon the land. The right given by such an appropriation is strictly not a right to the water itself, but a right to the use of the water. Its application to a beneficial use upon the land is as necessary in order to complete the right as is the diversion thereof from the stream. An appropriation of water, therefore, for the purpose of the irrigation of a parcel of land may not be established and completed by means merely of a declaration of intention or by the posting of notices of appropriation, nor may it be made by a canal owner or by a canal company as such alone, independent of its ownership of the land; but as application to a beneficial use upon the land is necessary to complete the appropriation, it follows that such appropriator must be an owner of land or have a possessory right thereto.

"Furthermore, since the land to which the water is to be applied is a necessary integral part of the appropriation and a factor by which the amount of water appropriated for use is measured, it follows that when the water is no longer applied to the land for which it was diverted, the right of appropriation of such water for such land ceases. The right of appropriation further depends upon a supply of water that is unappropriated. It follows, therefore, that the first in time of appropriation is the first in right to appropri-

ate, since water previously appropriated by another is no longer available for a subsequent appropriator. The extent of the appropriation is limited by the beneficial use to which the water can be applied.

"The actual amount of water that may be appropriated for irrigation, therefore, is the amount that the land owner can and does actually use in the necessary and economical irrigation of his land for cultivation. This much and no more may he have; and this much he may only have when there is sufficient water available to supply first those prior in date of appropriation. The fundamental principle in the doctrine of appropriation of the normal flow of water in a stream for irrigation is its application by the land owner to the land for a beneficial use. The right to appropriate is a right that belongs to the land owner, but the water appropriated is appropriated for the land, and when so appropriated its use belongs to the land and not to the appropriator. The method of diversion from the river and the means of carriage of the water to the land is immaterial in the establishment or maintenance of the right; it may be done by the individual appropriator or by an association of individual appropriators, or by a canal company, or by any person or corporation; and the means of carriage or the point of diversion from the river may be changed from time to time to suit altered conditions without impairing the right of appropriation already made, provided prior rights of others are not interfered with. There being in this Territory no private property in water, but water being a public property subject to the uses before defined, in so diverting and carrying the water such person, association, or corporation acts merely as the agent of the appropriator and acquires no right of appropriation to the water itself, and no rights as against the appropriation made to the land, except a right of proper compensation for such diversion and carriage."

ATLANTIC CITY WANTS THE CONGRESS.

A NEW candidate for the Nineteenth National Irrigation Congress for the year 1911 has entered the field—Atlantic City.

To this pleasure resort of the country, this seaside center, has come the word, evidently, of the progress and distinction of the National Irrigation Congress, and it wants it. In fact, it says so in no uncertain manner to Secretary Hooker of the Eighteenth National Irrigation Congress.

The Atlantic City publicity bureau is the agency that is writing Secretary Hooker, and its secretary-director, George S. Lenhart, says in a recent letter:

"We wish to obtain your next convention for Atlantic City, and trust that, at the proper time and place, you will take favorable action on this, our hearty invitation. Transportation can be arranged for at as low rates as any point in the country. We would have no trouble whatever in taking the best care of the delegates who attend your convention, and this bureau will give you all possible assistance desired without any expense to you for its services.

"This invitation is extended not only by the bureau of publicity but also on behalf of the Atlantic City board of trade, the Atlantic City Hotelmen's association, and the Atlantic City Business League."

This is the first time an invitation has come from Atlantic City for the sessions of the Irrigation Congress, and the fact that so many Eastern towns are asking for the honor of entertaining it shows the growing importance of the great organization.

The entry of Atlantic City makes nine aspirants for next year's congress. These are:

San Francisco, Chicago, Kansas City, St. Louis, St. Joseph, Milwaukee, Charleston, Rochester, some Texas town to be presented by the solid Texas delegation at Pueblo, and Atlantic City.

"COLORADO, THE HOST."

UNDER the above caption of Secretary R. H. Faxon, of the Board of Control of the Eighteenth National Irrigation Congress, Pueblo, September 26-30, has added another to his rapidly-growing list of little booklets and brochures, which he is circulating over the country by the tens of thousands. It follows:

"The State of Colorado will entertain at Pueblo, its second city in size, September 26-30, 1910, the greatest gathering ever held within its borders, or within the West.

"This is the Eighteenth National Irrigation Congress.

"Several thousand regularly-accredited delegates and interested visitors are expected from every state in the West and from many of the Eastern and Southern states, which are recognizing the great work of this congress.

"For the National Irrigation Congress is the greatest development agency in the country.

"It pointed the way to the reclamation act of June 17, 1902, resulting in 25 government projects, at a cost of 50 millions of dollars, and opening up more than 3 million acres of arid lands to settlement.

"It is the practical agency of the country in forestry and conservation.

"It has fostered the now great beet industry from struggling infancy to a point where the country confidently expects shortly to produce its own sugar consumption, and more than that to become a sugar-exporting nation.

"It is the originator of the home-making policy that is leading thousands of intelligent men 'back to the land'; provoking increased production; advocating scientific agriculture; and thereby decreasing the cost of living, a national problem.

"It is responsible for a better class of citizenship.

"It has taken the lead in soil-conservation.

"The foreign representation at the Pueblo congress will be large. It is now thought that from 30 to 40 foreign representatives from foreign countries will attend the congress. These will include diplomatists, foreign officials, engineers, and agriculturists and irrigationists.

"A great exposition of pumping machinery, water-raising and water-applying devices, and of modern irrigation methods, will be held on a large tract of ground immediately adjoining Mineral Palace Park, where the congress will be held.

"It is peculiarly significant and important that the greatest sessions of this great organization will be held in the State of Colorado. This state has 3½ million acres of irrigated land; has 20,000 miles of irrigation canals and laterals; raised 7 million dollars of apples under irrigation in 1909; has a single county that raises a million dollars worth of cantaloupes each year, and is the particular home of scientific, intensive agriculture under irrigation.

"Irrigation is rapidly changing Colorado from its former significance as merely a mineral and industrial state into one of the foremost agricultural states of the Union; and the marvelous development of the past two years, with the great number of irrigation projects, give exceptional promise to the state's enhanced position agriculturally and horticulturally by the end of the present year.

"Colorado has several wonderful sections, such as the northern district, where irrigation was first practiced in the state and which has successfully and intelligently solved all the problems of irrigation; the famous Western Slope with its marvelous accomplishments and possibilities in fruit; the newly-developed San Luis Valley, rich and promising; the northwestern section with its bountiful gifts of nature in the way of coal and other minerals; eastern Colorado with successful dry-farming in practice where water cannot be obtained for irrigation; and the rich Arkansas Valley, of which Pueblo, the congress city, is the capital, with its sweep of 275 miles from Canon City to Garden City, Kansas, under irrigation, and its ½ million acres of fertile watered lands, its seven beet mills and its vast alfalfa fields."

Colorado Pioneer Irrigation State

By R. H. FAXON,

IT is a peculiarly appropriate and equally significant fact that the Eighteenth National Irrigation Congress, Pueblo, September 26-30, 1910, will be held in the city named for the tribe of Indians that first practiced the ancient art of irrigation in this country—the Pueblo Tribe.

The Indians inhabited portions of what are now the territories of New Mexico and Arizona, as well as southern Colorado. Their descendants were still cultivating the land and practicing irrigation when the Spanish came to these parts, centuries ago, with the sword in one hand and the cross in the other. Traces of the work of this tribe are still to be found in the great Southwest, and the marvel of modern engineering is the precision with which they constructed their ditches and their works.

The Mormons, in Utah, were the first English-speaking people to entertain the practice of irrigation in anything like a systematic manner, in the West, and their successes are a matter of history. Southern California was the next English-speaking section of the West to put water on the land, and it partly grew from the labors of the placer-miners, who utilized the water with which they washed their ore to grow crops upon the lands.

Colorado, in its northern section, was one of the first

One of the most gratifying things of the year, and a result that may be directly traced to the influence of the National Irrigation Congress, is the act of Congress approved February 25, 1910, amending the census act in several particulars but more especially providing for a complete census of private irrigation projects.

This contemplates the acreage, the crops, the capital invested, and will furnish accurate and official figures for the benefit of not only irrigationists and agriculturists, but engineers, capitalists, and publicity experts. This inquiry will be made a portion of the regular census-taking to begin April 15. The unusual effort put forth by the friends of the Eighteenth National Irrigation Congress and its officials is directly responsible for this marked progress and result.

An irrigation publicist has recently figured, in a careful and conservative way, that a census today would show fully 250,000 farms in the United States under ditches, watering more than 15 million acres of lands. The state of Colorado, within which the Eighteenth Congress will be held September 26-30, next, leads all other states, having $3\frac{1}{2}$ million acres under water, and 20,000 miles of canals and laterals. California has the largest number of irrigators, while the state of Washington has the greatest percentage in the number of irrigators.

The world at large has 75 billion acres under irrigation.

It is interesting to know that there were but 20,000 acres under irrigation in 1870, compared with the 15 millions at present. That was 40 years ago. The National Irrigation Congress was born in 1890. So the life of the



Mineral Palace and Park, Where the Eighteenth National Irrigation Congress Will Hold Its Sessions.

portions of the West to lend its attention to this ancient art, and its success has been marked. Every problem in irrigation—and there are many—has been solved in the Fort Morgan, Fort Collins, Boulder, Greeley districts and on the North Platte and Cache la Poudre.

It has been estimated that there are 40 million acres in the West susceptible of irrigation, of which the 25 government projects now complete or in process of construction will comprise more than 3 million acres. Private projects have already taken care of more than 10 million acres, and other private projects now in contemplation or under way will have an additional acreage of 5 millions. Added to this must be enumerated proposed government projects, 13 in all, ready for funds to construct them, having an acreage of $3\frac{1}{4}$ millions.

There are many private projects in the country of enormous proportions, but the largest actually under way is the DeWeese project at Pueblo, which will take care of 300,000 acres, and on which work is now beginning. There is a chain of related projects on the Snake river in Idaho of larger acreage, but not a single project like the DeWeese at Pueblo; and another of large acreage, the Horseheaven in Washington, which is now being organized, will plan to put 600,000 acres under water. Projects promoted by private capital and having 100,000 acres are by no means unusual, and two of these are in the Pueblo county.

congress that gave the West and the country the national reclamation act and really started this great development work, is exactly one-half the time that has elapsed since there were but a paltry 20,000 acres under water in the United States.

It is, then, quite appropriate that the latest and greatest of the annual sessions of the most potential development agency of the country should be held in the state that leads all in the acreage under irrigation, and in the city named for the tribe of Indians that introduced and successfully practiced irrigation in this country first of all, centuries ago.

BIG SALES OF CYCLONE DRILLS.

THE Cyclone Drill Company, of Orrville, O., report the following sales:

Nine blast hole drills for John B. Carter Company for various contracts in Maryland and Pennsylvania. Four prospecting machines for Jacobs & Davies for testing foundations for the large government dam on Tennessee River, near Chattanooga, Tenn. Blast hole drill for Shore Line Stone Co., Monroe, Mich. Blast hole drill for Empire Limestone Co., Buffalo, N. Y. Blast hole drill for Barr-Clay Co., Streator, Ill. Blast hole drill for France Slag Co., Toledo, Ohio, together with a number of water well drills and prospecting outfits for various concerns.

RAILROAD MEN AND THE CONGRESS.

Interests Vitally Interested in Reclaiming the Land
to be Represented by Their Officers.

BY R. H. FAXON,

Director of Publicity, Eighteenth National Irrigation Congress.

NO force of men can be more interested in the welfare of the city of Pueblo or of the Eighteenth National Irrigation Congress, or of the State of Colorado as a whole, than the officials and employes of the great trans-continental systems of railroads penetrating the mountain-west.

The fact that these great railroads find, on the way to the East and West, the city of Pueblo standing sentinel, the gateway through which this line of traffic must pass, lends especial interest to the city in the happenings of the system, and to the system in the happenings of the city and state.

The Eighteenth National Irrigation Congress will be held in Pueblo, September 26-30, 1910.

It will bring to Pueblo, the Arkansas valley, and the state of Colorado thousands of delegates and visitors. It will bring distinguished representatives from foreign governments. It will bring important officers of the national government at Washington. It will be the most important gathering ever held in the West. It will bring visitors who, following the conclusion of the congress, will want to see Colorado; will want to have a look at the incomparable Western Slope with its fruit; at the capital city of the State; and the splendidly-irrigated and developed section of Colorado lying north of Denver.

Hence, while the advertisement and benefit that the city of Pueblo will naturally derive is exceedingly great, the advantages and opportunities will flow to the entire State.

The National Irrigation Congress is the most important non-official body in the country. It has been in existence longer than any of its associate organizations. It represents a field that, sectional in the first place, has now become national. Its resolutions have been written into statutes, and its discussions and endeavors have become fixed national policies. Its members are among the ablest statesmen, thinkers, scientists, agriculturists, irrigationists, engineers and publicists of the country. Nothing that it says or does fails to interest the national government and the whole people.

An example of this is the doctrine of home-building and home-making, originated by the National Irrigation Congress years ago. The desire of man for land, the wish to make a home, to be a producer and contributor, was largely anticipated by this organization, and for a decade it preached the doctrine, with the result that everywhere in the country today it is recognized.

The national reclamation act had its inception in the National Irrigation Congress. It sent its committees and its officers to Washington to labor with the national law-givers long before the latter finally enacted the law of June 17, 1902. The tremendous impetus given the reclamation of arid lands and transforming the desert into the garden, in which the government and the engineer and the private land-owner and the capitalist have worked with a singleness of purpose in the years since, has been felt, not alone in the West, but all over the country.

The ambition for the time when this country would produce the amount of sugar it annually consumed, and might even become a sugar-exporting nation has always been uppermost throughout the country. The National Irrigation Congress has fostered and protected and builded up the beet industry all its life, and there is promise of the fulfillment of the hope of the country in respect of sugar production, largely through the efforts of the National Irrigation Congress.

The National Irrigation Congress is a potential, energetic agency toward development—development not only of the West, but of the country as a whole, and that,

after all, is probably the best thing that could be said of it.

The great bodies of land in Colorado and in the vicinity surrounding Pueblo hold out great promise for the land-hungry, and herein is the opportunity for Pueblo and the State to present the attractive situation that exists. The magnitude of the development work going on today in the State of Colorado is not excelled anywhere in the West, and there is wonderful activity in the Pueblo section.

The Eighteenth National Irrigation Congress is a distinct compliment, by reason of its meeting-place in Pueblo this year, to this tremendous activity in furthering agriculture under irrigation.

STOCK FINISHING ON THE IRRIGATED LANDS AT UVA, WYOMING.

The rich and perfectly irrigated lands at Uva, Wyoming, offer an ideal advantage over most such projects by enabling the farmers to go into stock raising as well as mixed farming. This industry is growing very fast and is proving highly profitable, first, because the day of open ranges is rapidly passing, and next, because the home-fed stock is of better quality. The peculiar situation of the Uva lands favors home feeding at its best, and at a low cost to the farmer.

North and east of Uva, in Southeast Wyoming, there are enormous areas of government land, insufficiently watered for farm purposes, and not reserved for the use of any group of cattlemen, but free to be used by anyone having cattle or sheep and a home farm for finishing. On these semi-arid reaches, any man who owns 160 acres of the irrigated land at Uva may run three to five hundred head of cattle or several hundred sheep, the cattle taking the best growths and the sheep cropping the rest. The natural grasses and herbage are nutritious and sufficient to form up the animals and keep them in good condition through nine months of the year. Three months additional feeding at the home farm on alfalfa and grain grown for that purpose rounds them out to full weight and brings them into prime market condition, fully rested and only a short run by rail from Uva to Cheyenne, Denver, Kansas City or Chicago, where they bring top prices.

No good farmer needs be told that hay turned into beef or mutton brings more money with a less proportion of trouble than if it were sold in the bale. Relatively, the same holds true of corn and barley. That is one reason why a man in the Uva country, having say 500 tons of alfalfa on his place and a bunch of animals to eat it, can borrow money at the bank. It is a particularly safe loan.

This phase of fattening and finishing works out equally well with either sheep or swine. The experience of farmers in the neighborhood of Uva has proven it with sheep, particularly. Lambs can be bought for \$2.50 or \$3.00 each from the sheep men outside, and three pounds of alfalfa a day for three months, with one pound of barley added for the final month, will turn out a creature worth \$6.00 to \$7.00 delivered on the siding at Uva or the nearest other station. These figures do their own talking.

While the stock interest is growing larger every season at Uva, it is by no means excluding other production. General farming is far more remunerative than it is anywhere east of Central Nebraska and Kansas. Sugar beets, wheat, oats, potatoes, and the same general growths that are common to the Middle Western States yield much more heavily than in those States, and bring higher prices at home—for little is shipped out unless tempted by exceptional prices in years of shortage elsewhere. In fact the district wheat crop is insufficient for the local mill supply. The price is always over a dollar and sometimes runs close to a dollar and a half. Three hundred to five hundred bushels of potatoes are usual, and the price runs from high to very high, as compared with the middle west. Sugar beets give twenty tons per acre, and up, and bring \$5.00 a ton flat. A mill is to be put up at a convenient point close by as soon as the farmers have pledged a sufficient acreage to insure supply, and the presence of this mill will give further stimulus to cattle and hog raising. But alfalfa has shown itself to be the strong and sure money-maker, especially when the grower is also a stock-feeder, but even without stock, it turns in a fine profit. The presence of some aliment peculiarly favorable to it in the soil makes it a better all-round ration than most alfalfa grown elsewhere.

Uva is less than a hundred miles north of Cheyenne, but lies about 2,300 feet lower, at the base of the Rockies, in a beautiful valley, through which run two rivers that never go dry. These rivers are full of rainbow trout. It is a pretty place, and healthful at all times, with pure air, and no extremes of heat or cold. Farm help is always to be had. There is a perpetual supply of fuel from the coalfields of the region. There are good schools, good stores, good telephone service, rural free delivery, and daily trains over the new through railway from Seattle to Galveston, on which Uva is a station. The run to Denver by way of Cheyenne takes only a few hours. In respect of being very much in the world, the Uva district is quite like the neighboring district of Greeley. But it is not very large. Considerably less than 10,000 acres of it remain to be sold, and part of that acreage is under the Carey act, so that prices are not high, and the sales are made on time. The Uva irrigation system is a model for all the west.

Send \$2.50 for The Irrigation Age, one year, and cloth-bound copy of the Primer of Irrigation.

ARID AGRICULTURE

BY

B. C. BUFFUM, M. S.

Manager of the Wyoming Plant and Seed Breeding Company, Worland. Former Professor of Agriculture in the University of Wyoming and the Colorado Agricultural College, and Director of the Wyoming Agricultural Experiment Station.



PROF. B. C. BUFFUM.

Irrigation Farming.

The small boy eats too many green apples just to keep them from going to waste, and the farmer acquires too much land just because he wants the earth. The relation between the size of a farm and its economical working and management has not been given the attention it deserves. Under humid conditions a man could hold much land without feeling any especially baneful effects. Under irrigation the whole problem is changed. In the West, land is abundant, water is scarce; land is cheap, water is expensive. Investments in water rights are too valuable to lie idle. The farmer has less time to do things and get them done in season. Intensive culture characterizes irrigation agriculture. When a crop needs irrigating, the need is urgent. It cannot be put off for the whole crop and the margin of time may be too small to make it profitable to put off farm operations on any part of the field. Maximum returns are only made on small fields, well tilled and irrigated. A farmer may be self-supporting on ten to twenty acres. He finds all he can attend to on forty acres to sixty acres and generally has too much land if he tries to farm more than eighty acres. This will depend largely on the kind of crop raised. If intensive cropping is done with sugar beets or potatoes in proper rotation the small farm pays best. If the land is all in alfalfa and pasture, larger areas can be managed.

It is safe to say that a great majority of new comers to the West buy at the start from two to ten times as much land and water right as they should.

There are many specialties in irrigation farming. Raising crops for sale is pure farming. This kind of farming requires special knowledge of the subject in order to keep up the soil fertility, and practice culture suitable to the crop produced.

Mixed farming is surer—requires more general and less special knowledge, helps in the economy of living, diversifies the farmer's interests, keeps up soil fertility and makes one thing pay expenses while another may build a bigger bank account. The products from poultry, cows and pigs distribute the money income through the year, and make it less necessary to borrow money at the bank, at interest, to pay expenses until crops may be sold. Garden and animal products secured with home labor save important items of cash outlay in the household expenses. There may be more or less pasture or range to use which will decrease the expense of keeping stock. The general farmer will succeed better if he keeps stock and markets his crops on four feet.

Our soil culture directions for dry farming pertain as well to irrigation, except the summer-fallow, which is unnecessary, with plenty of water to be applied when and where needed. With water and advanced knowledge of how to maintain soil fertility, there is no need of letting any land rest from crop production. Soil culture needs to be given careful and intelligent consideration and special systems are being worked out for the separate intensive crops. Plowing need not be done so deep at first and on some soils shallow plowing may give better results than deep plowing. More attention needs to be given to leveling and smoothing the land where irrigation is practiced. The right kind of land preparation is a permanent improvement which pays from the first because it saves much future expense and trouble. Irrigation farming is a "new agriculture" in the West, and a man needs to know it in order to meet with the success which should crown his efforts. On the same soils and under the same con-

ditions the man who knows how will get fifty bushels of wheat while the one who does not will get twenty-five bushels. Right culture will give one man 300 sacks of potatoes per acre and wrong culture another man 50 sacks per acre. There is a considerable profit to the man who gets 300 sacks of potatoes if he uses \$40.00 expense per acre to raise the crops, over the man who gets 50 sacks by an expense of \$15.00 per acre. One man nets \$185.00 per acre and the other makes \$22.50 per acre. The man with the large yield probably works only a forty-acre farm, and from twenty acres of it in potatoes banks \$3,700.00 for that crop. The second man is probably trying to farm eighty acres, and from forty acres in potatoes he banks \$900.00. The little farm well tilled has brought its owner over four hundred per cent the largest net income. The point made is that good tillage for irrigation means thorough tillage and special systems of soil and crop management to produce the best returns.

Fertility is measured by the power of soil to produce crops. As we have shown, moisture is an essential element of fertility. Other elements are nitrogen and minerals which are direct plant foods. In much of the irrigated region the waters used contain large amounts of dissolved fertilizing elements. It has been shown that waters which contain much silt carry with them large amounts of dissolved plant foods. Studies of the waters used in irrigation from the Rio Grande River showed that where water was used to the depth of one foot it deposited 955 pounds of potassium, 58 pounds of phosphoric acid, and 53 pounds of nitrogen to each acre. This would be a sufficient supply of nitrogen for more than thirty bushels of wheat per acre, enough phosphoric acid for thirty bushels per acre, and enough potassium to last for thirty years, if as much wheat was raised on the land each year. Such large amounts of soil fertility are unusual, however, but even our clear waters from mountain streams carry with them a considerable amount of silt and plant food in the late spring and early summer. Under irrigation such large annual crops are taken off the soil that the subject of available plant food becomes an important one. Our soils will wear out unless a good farm practice is inaugurated which will keep them productive. With a proper system of rotation and cropping, adding plant food to the soil in the form of barnyard manure, the waste of feed pens, green manure and growing of leguminous crops will keep the soils always richly productive. Only in special locations or with special crops will the use of any artificial fertilizer be found advisable.

There has been much useless alarm about alkali. Our soils are very rich in soluble salts and in places these accumulate to such an extent that they destroy productiveness. The alkali salts are dissolved by water, and where there is not good drainage below, this water evaporating again from the surface, leaves the alkali behind as a white incrustation where it is most detrimental to plants. In nearly all cases the alkali accumulation is the result of bad management, generally of over-irrigation or of continuously leaving the water running on the soil. In many parts of the West where the native sod is irrigated for the production of hay, the water is allowed to run for weeks or months over the same land, and such irrigation is apt to produce bad results. Some irrigation waters contain large amounts of alkali salts which are deposited with the water applied.

There are two kinds of alkali which are found in different sections of the arid region. In the mountain states where the climate is cool, the white alkali predominates. White alkali is a mixture of the sulphates and chlorides of soda and magnesia. In the warmer regions the alkali is composed of carbonate of soda and is called black alkali. One-tenth of one per cent of black alkali will prevent the growth of useful plants on the soil, while some crops will stand as much as one per cent of white alkali salts in the surface soil. These alkali salts in small amount are important aids in the fertility of the land. They make plants grow faster and better than where they are not present. The black alkali destroys the soil tilth, puddling it and making it dark in color. The principal detrimental effect of white alkali seems to be that it retards or prevents the germination of seed. If the salt can be diluted or washed out before planting and a good stand of plants obtained from the seed, the crop may grow to maturity and make a good yield.

The black alkalies of California have been corrected by changing them into white alkali which is less detri-

mental. This is done by adding considerable quantities of gypsum or land plaster. Land plaster is sulphate of lime. When this comes in contact with carbonate of soda there is a chemical change and the carbonate of soda becomes sulphate of soda, and the sulphate of lime becomes carbonate of lime or common limestone. The remedy for white alkali is to provide proper drainage and wash the salts out of the soil with irrigation water. The worst alkali soils may be made productive in this way.

There are a few crops which will thrive in the presence of much white alkali. The principal one is the sugar beet. If the salts can be diluted by irrigation before the seed is planted so there is no serious retardation of germination, sugar beets will make good crops on strong alkali soil. Another useful plant to grow in places which would otherwise be waste, is the English or Dwarf Rape for soiling and pasture. One of the best plants to grow in such places either for forage or to improve the soil in

supply the early growth of the plants. Potato soil should be irrigated in the spring before it is plowed. Some crops, like potatoes and sugar beets, require the most moisture in the later part of the season. Wheat should be irrigated most during the middle part of the time of its growth. To be on the safe side, barley should be irrigated when quite young. These things show the variations which must be practiced to produce the best results and point to the importance of the farmer looking up the culture for each crop he expects to raise. Some few crops, like onions, should be flood irrigated. Other crops give best results if water is never allowed to touch the crowns of the plant. Some crops should not be irrigated at certain stages of growth unless absolutely necessary to save them. Experience tells the farmer when his crop is suffering for water and no general rule can be laid down. Short season crops may be ripened early by keeping water away. Often late



Wet Mountain Spring Snows Make Flood Water for Storage. A Typical Wyoming Scene.

vegetable mold is the white sweet clover. There is no need of leaving the alkali places as unproductive and unsightly wastes.

Different crops and each kind of soil require particular treatment and general rules are only of value in so far as they throw light on the underlying principles which may be made use of by the individual farmer who understands them and their application.

As a broad general statement, we believe the time to irrigate is when there is no crop growing. Nearly all crops should be irrigated before they are planted. The soil should be put in the best possible state of tilth and stored with enough moisture, at least to germinate the seed and

irrigations are responsible for injury to the immature crop by frost.

Over much of the arid region there is possibility of running water on to the soil in the winter season and often sufficient moisture may be stored for the production of most excellent crops the following season. On some farms in the West, even during freezing weather, the water supply from springs or ditches may be run on the land and stored, either as moisture in the soil or as ice on the surface. Using the water in this way in the winter and the same water for irrigating additional land in the summer makes a small water supply cover double the amount of land.

Everything the farmer can do to make the application

of water to his crop and soil more efficient, should be done. When either flood irrigation or irrigation by furrows is practiced, the crop should be drilled with the slope of the land so the water is more rapidly spread by following the furrows. There is one form of drill that we would recommend irrigation farmers to avoid. This is the single disc drill. The single discs are set opposite ways each side of the center and throw the soil in opposite directions. This makes ridges of soil which interfere with spreading the water in irrigation. In small fields where it is desired to avoid back furrows or dead furrows the two-way plow will be found of advantage. This implement is a double plow which swings on a pivot and can be changed at the end of each furrow so the land may be plowed from one side to the other without leaving any ridges and with the least amount of turning and tramping of soil by the team. We recommend the use of the four or eight-horse leveler which may be run over the ground both ways after every plowing. Such leveling of the soil saves much work in the distribution of water.

On new land where the sub-soil is almost invariably dry, much water will be needed the first two seasons to moisten this sub-soil or fill it with the capillary or film moisture, which surrounds the soil particles. Much of this



Outlet of Cloud Peak Lake, Wyoming, Big Horn Mountains. Perennial Water Supply.

moisture will be held from year to year and it will not be necessary to apply such large amounts in irrigation. The total amount of water to give the best results on different soils and different crops, varies greatly. On light sandy bottom soils with gravel underneath, farmers sometimes use from six to eight feet deep of water during the season. A flood irrigation cannot be made with less than four to six inches at a single application. Usually a thorough flood irrigation will require from nine to eleven inches deep of water over the surface. This does not mean that enough water must run onto the land to stand to this depth, but that the amount soaked into the soil or run off as waste will total enough to reach the depth indicated if it all remained on the surface. The irrigation laws of the arid states generally provide that the limit of a water right shall be one cubic foot per second continuous flow for from seventy acres to one hundred acres of land. As a general rule, it is thought that enough water to cover the land to a depth of two feet is a sufficient average for Western crops. We are learning more all the time about the economic use of water.

To do effectual irrigating the farmer needs a good sized head of water. A very small stream soaks away too fast and cannot be spread over sufficient land. On land which lies well for irrigation an experienced irrigator can handle a head of from two to three cubic feet per second. If he only has a water right for eighty acres of one cubic foot per second, it usually pays to rotate in the use of water with a neighbor in order to do his irrigating in the

(Continued on page 532.)

HAWAII AND IRRIGATION WORK.

FROM far-off Hawaiian Islands comes a note of encouragement to the Eighteenth National Irrigation Congress, Pueblo, September 26-30, and the expression of the hope that the event will be a complete success. Not only that, but there is the official word of the governor that the islands will be represented, as usual.

Writing the secretary of the board of control, Governor W. F. Frear says:

"I shall be very glad to appoint delegates to the next National Irrigation Congress if I can find suitable men who can attend at so great a distance, at that time.

"Two years ago, I appointed one delegate, and last year I appointed five delegates, to the National Irrigation Congress.

"This is a subject in which the territory is greatly interested, and, indeed, in which it has already accomplished a great deal and is now doing a great deal.

"It is doubtful if any other state or territory is doing as much as this in the various lines in which the congress is interested."

Not only that, but the Hawaiian newspapers are printing pieces about the big Pueblo event. The director of publicity of the Eighteenth congress recently received a roll of papers containing the most interesting and flattering reference to the congress here, and also special stories that had been sent from here to persons interested in the islands.

Ralph S. Hosmer, superintendent of forestry under the territorial board of agriculture and forestry, writes Secretary Faxon of the board of control, that he not only has put out to the leading newspapers information he has received concerning the work of the congress and preparation for the coming sessions, as well as data touching Colorado and other Western states, but would like some special stories, which have been sent to him. Mr. Hosmer generally attends the sessions of the congress, and expects to do so this year.

The work in the territory of Hawaii, together with that in Cuba as recently mentioned, and the interest in Porto Rico, certainly attest to the alertness of the insular possessions and neighbors of the United States in the big work of development as typified by the labor of the National Irrigation Congress. It also is significant from the standpoint of important attendance at the Pueblo sessions next September.

PITTSBURG'S BIG LAND SHOW.

FOLLOWING the example of the Chicago Tribune and the Chicago Examiner, Pittsburg will give a land show in October under the auspices of the Pittsburg Gazette Times and the Pittsburg Chronicle Telegraph. It will be held at Duquesne Garden, October 17 to 29. It will be educational in the broadest sense and will be of great interest to thousands of people who have a desire to get back to the land. The exposition will give a great deal of valuable information as to where the best and cheapest lands lie, what they will produce and where the most profitable markets may be found. It will provide the farmer, market gardener and city dweller with instructive and graphic information regarding the land of our country, and to give the people of this section an idea of the rapid colonization and wonderful progress which is being made in the cultivation of the vast lands in the remote regions of the South, Southwest, middle and far West and other sections. Incidentally, the home farmer and gardener will have opportunity at the show to study methods that have proved successful elsewhere.

A wave of land enthusiasm is undoubtedly sweeping over the country and it is a fact that the present area of cultivated ground is inadequate to supply the vast quantities of farm products which are required to feed the ever-increasing population of the eastern and central states. There is in consequence a large and growing demand for farm lands and prospective home-seekers, farmers and investors, are hungry for authentic information regarding land investments in new and arable sections. The National Land and Irrigation Exposition is organized to supply this demand.

Inquiries on the subject of the Land Show should be addressed to the Land Show Editor of The Gazette Times, Pittsburg, Pa.

Irrigation of Orchards

BY SAMUEL FORTIER

Chief of Irrigation Investigations, Office of Experiment Stations, U. S. Department of Agriculture.

Selection of Lands for Orchards.

CARE and good judgment should be exercised in the selection of an orchard tract. If it turns out well the profits are high, but if it fails the losses are heavy. It involves the setting aside of good land, the use of irrigation water, and somewhat heavy expenses in purchasing trees, setting them out and caring for them until they begin to bear.

Assuming that the climate and soil of the district selected are adapted to the kind of trees to be grown, the next most important things to consider are good drainage and freedom from early and late frosts. Low-lying lands under a new irrigation system should be regarded with suspicion, even if the subsoil be quite dry at the time of planting. The results of a few years of heavy and careless irrigation on the higher lands adjacent may render the lowlands unfit for orchards. On the other hand, the higher lands are not always well drained naturally. A bank of clay extending across a slope may intercept percolating water and raise it near the surface. Favored locations for orchards in the mountain States are often found in the narrow river valleys at the mouths of canyons. The coarse soil of these deltas, the steep slopes, and the daily occurrence of winds which blow first out of the canyons and then back into them, afford excellent conditions for the production of highly flavored fruits at the minimum risk of being injured by frost.

Proper exposure is another important factor. In the warmer regions of the West and Southwest a northern exposure is sometimes best, but as a rule the orchards of the West require warmth and sunshine, and a southerly exposure is usually most desirable. Natural barriers frequently intercept the sweep of cold, destructive winds, and when these are lacking, wind-breaks may be planted to serve the same purpose. Depressions or sheltered coves should be avoided if the cold air has a tendency to collect in them, a free circulation of air being necessary to drive away frost. The low-lying lands seem to be the most subject to cold, stagnant air.

While experience has shown that orchard trees of nearly all kinds can be successfully grown on soils that differ widely in their mechanical and chemical composition, it has also shown that certain types of soils are best adapted to particular kinds of trees. Thus the best peach, almond, apricot and olive orchards of the West are found on the lighter or sandier loams; the best apple, cherry, and pear orchards on heavier loams; while walnut, prune and orange orchards do best on medium grades of soil. The requirements of all, however, are a deep, rich and well-drained soil.

Typical Water Supplies for Orchards.

Formerly most western orchards were supplied with water through earthen ditches. These leaky, unsightly channels, by reason of their cheapness, would have been quite generally retained had it not been for the increasing value and scarcity of water. The value of water for irrigation purposes has increased beyond the average of that given by the census report of 1902 over 300 per cent. In many localities there is likewise

great scarcity at certain times. These rapidly changing conditions have induced many water companies to save some of their heavy losses in conveying water supplies by substituting pipes for open ditches in earth, or else by making the ditches watertight by an impervious lining.

The high value and scarcity of the water in natural streams have likewise induced orchardists to install pumping plants to raise water from underground sources. It was estimated that in 1909 20,000 of these plants were in operation in California alone. In other parts of the West reservoirs are being built to supplement the late summer flow of streams which fail to provide enough water for all.

The few typical examples which follow may not only give the reader an idea of how orchards are supplied with water, but indicate also the customary division into tracts to serve this and other purposes.

The Lewiston Basin is located where Clearwater River flows into the Snake River in western Idaho, and varies from 700 to 1,900 feet above sea level. A few years ago water was brought from neighboring creeks and stored in a reservoir. The water required for orchard irrigation is conducted from this reservoir under pressure in two lines of redwood stave pipes over the rolling hills which separate the reservoir from the orchard lands. On these lands contour lines were first established, and each quarter section was afterwards divided into 40-acre tracts by 60-foot streets. These were further subdivided into eight 5-acre tracts, with a 20-foot alley

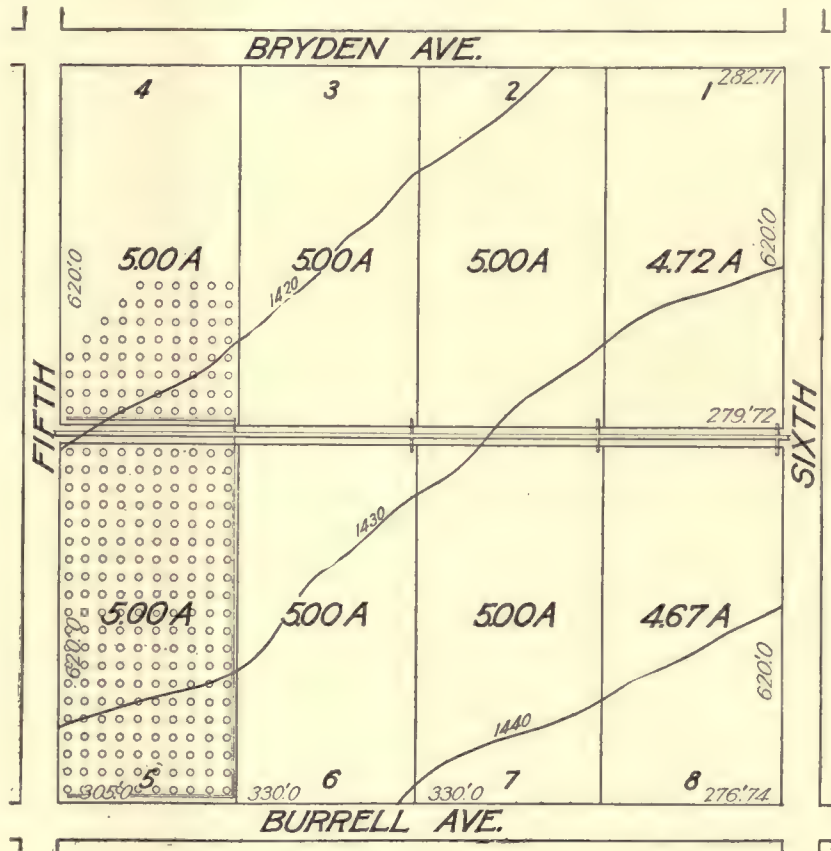


Figure 1.

through the center. Figure 1, showing block 28 of the survey, indicates the general arrangement. The large conduits from the reservoir are connected to smaller lateral pipes laid in the alleys, and these in turn are tapped by 3-inch pipes, which furnish water to the 5-acre tracts.

The town of Corona, Cal., is hemmed in on all sides by lemon and orange orchards. The chief water supply for these groves comes from Perris Basin, 40 miles distant. The Temescal Water Company owns 3,600 acres of water-bearing lands in this basin, and at favorable points pumping plants have been installed. These plants are operated by motors supplied with current from a central generating station located at Ethenac.

The discharge from each pump is measured over a rectangular wier having an automatic register. This device is shown in Figure 2. Small lined channels convey the water from the pumps to the main conduit shown in cross-section in Figure 3. The concrete lining of this conduit is composed of one part cement to seven parts sand and gravel, having a thickness on the slopes of $2\frac{1}{2}$ inches and on the bottom of 3 to 4 inches. The lining is rendered still more impervious by the addition of a plaster coat one-fourth of an inch in thickness, composed of one part of cement to two parts of sand. The cost was $5\frac{1}{2}$ cents per square foot, or 55 cents per linear foot. The main conduit consists of about 30 miles of lined canal and 10 miles of piping 30 inches in diameter. The groves

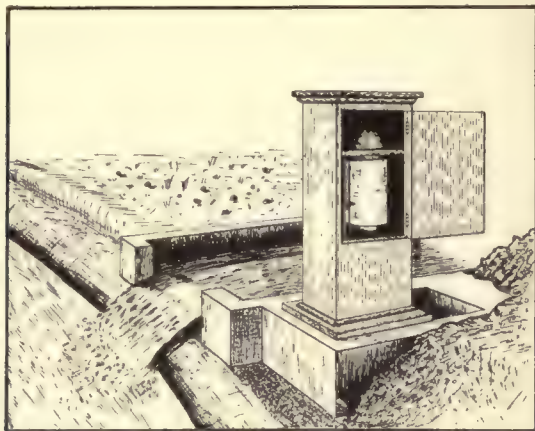


Figure II.

are laid out as a rule in 10-inch tracts, and piping of various kinds conveys the water from the main to the highest point of each tract, from which it is distributed between the rows in furrows.

A large part of the water used by the Riverside Water Company is pumped from the gravelly bed of the Santa Ana River. From thence it is conveyed in a main canal to the orchard lands and distributed to the groves in cement and vitrified clay pipes. The owner of a tract, whether it be 10, 20, 30 or 40 acres in extent, receives his supply at the highest corner through a hydrant box. Each hydrant box not only allows the water to pass from the end of a lateral pipe to the head flume of the tract to be irrigated, but also measures the amount in miner's inches under a 4-inch pressure head as it passes through. A section of the hydrant box showing the adjustable steel slides to regulate the opening is given in Figure 4.

On the Gage Canal system in Riverside County, Cal., the water supply for the tiers of 40-acre tracts is taken from the canal in riveted steel pipes varying from 6 to 10 inches in diameter. These larger mains are connected with 4, 5 and 6-inch lateral pipes of the same material, which convey the water to the highest point of each 10-acre tract. This general arrangement is shown in the sketch, Figure 5.

Clearing and Grading Land For Fruit.

As a rule fruit trees are planted on land previously cultivated and cropped. One of the best preparatory crops for orchards is alfalfa. This vigorous plant breaks up the soil and

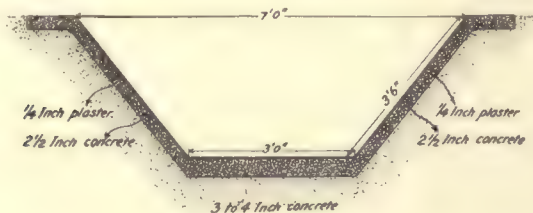


Figure III.

subsoil by its roots, collects and stores valuable plant foods, and when it is turned under at the end of the second or third year leaves the soil in much better condition for the retention of moisture and the growth of young trees.

In the Bitter Root Valley, Montana, new land is first

plowed 8 to 12 inches deep, then carefully graded and smoothed and seeded to red clover for one or two seasons. On the west side of this valley pine trees and pine stumps are encountered. These can best be removed by burning. A hole $1\frac{1}{2}$ inches in diameter is bored through the base of the stump or tree in a slanting direction. It is near the surface of the ground on the windward side and about 18 inches above the surface on

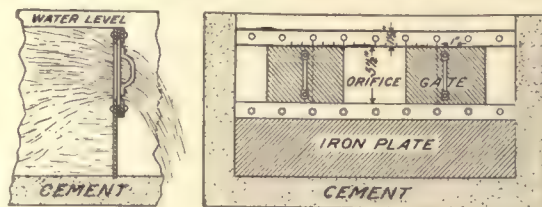


Figure IV.

the leeward side. A fire is then built in the hole, using small twigs to start it. As the fire burns the opening is increased and larger limbs are inserted. In two or three days the stump will have burned out, the fire burning down into the roots to a depth of 12 to 14 inches. The cost of such clearing varies with the character of the land and the density of the growth. From \$10 to \$15 an acre will clear the land of stumps and it then costs \$5 to \$10 to get the unburnt roots plowed out and the land ready for planting.

In recent years large areas of wooded lands in both the Hood River and Rogue River Valleys of Oregon have been cleared in order to plant apple trees. One of the methods employed in the Hood River district to rid the land of its growth of fir, pine, scrub oak and laurel is similar to that just described. Another method consists in splitting open the stumps with giant powder and then pulling out the roots with a stump puller. Stump pullers of various kinds are used in California

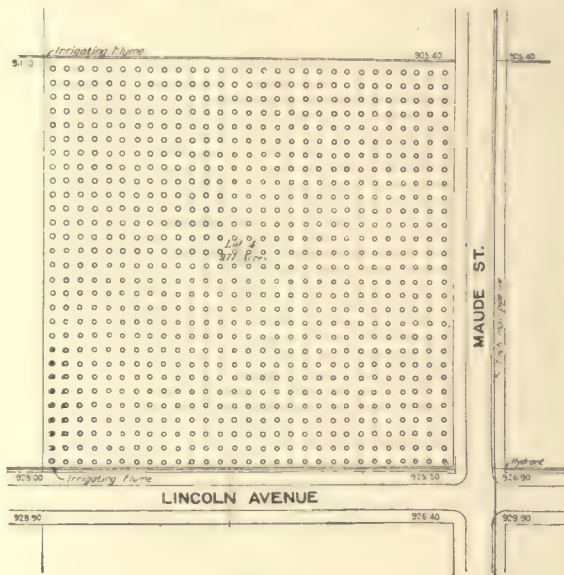


Figure V.

for a like purpose. The most powerful of these consists of a portable engine, windlass and cable similar to an ordinary hoisting plant. A heavy chain is fastened to the tree at the proper height above the ground. To this chain the pulling cable is hooked and when the power is applied the tree is pulled out by the roots.

In New Mexico and Texas the mesquite is usually grubbed out by Mexicans, but in California, where labor costs more, such shrubs as mesquite, manzanita and chaparral can be more cheaply removed by a stout pair of horses and a logging chain.

An effort should be made to establish a fairly uniform grade from top to bottom of each tract. This is done by cutting off the high points and depositing the earth thus obtained in the depressions. The length of the furrows should not exceed one-eighth of a mile and in sandy soil they should be shorter. As a rule, it is not difficult to grade the surface

of an orchard so that small streams of water will readily flow in furrows from top to bottom.

Locating the Tree Rows.

In setting out orchards which are to be irrigated, the elevation of the surface of the ground should first be ascertained. This is usually done by making a contour survey by which each tract is divided up into a number of curved strips or belts by level lines, the vertical distance between them in this particular case being 1 foot. With these as a guide the direction of the three rows can be readily determined.

Where the trees are watered in basins or checks, flat slopes are not so objectionable, but in furrow irrigation a slope of about 2 inches to the 100 feet is necessary to insure an even distribution of water.

When streams are to be run in the furrows the slope of the furrows may be increased to 8, 10, and even to 12 inches to the 100 feet. On slopes varying from 10 to 40 feet to the mile, the tree rows may therefore be located at the proper distance apart down the steepest slope. Under such conditions the trees are most commonly planted in squares. The location of the trees can be best fixed by the use of a surveyor's transit and steel tape. When these are not available, a woven-wire cable about three-sixteenths of an inch in diameter will answer the purpose. If apple trees are to be set out and it is desired to have them 32 feet apart, tags are inserted between the strands of the cable to mark this exact distance. A base line at the proper distance from the fence or one margin of the field is then laid down and long sighting stakes driven at each tag. The corner is then turned with a 100-foot tape or link chain. First measure from the end of the base line a distance of 30 feet. Hold the one-hundred end of the chain at this point, and the 10-foot link at the corner; take the tape or chain at the 50-foot mark or link and pull both lines taut. A stake driven at this vertex will establish a point on a line at right angles to the first. When stakes have been set on all four sides the intermediate locations for the trees can be readily ascertained by sighting between corresponding marginal stakes.

Where the slope is steep and difficulties are likely to be encountered in distributing water, the equilateral, hexagonal, or septuple method of planting, as it is variously termed, should be adopted. The manner of marking the ground for this method is indicated in Figure 6. It will be observed that in this method the ground is divided up into equilateral triangles, with a tree at each vertex. The trees

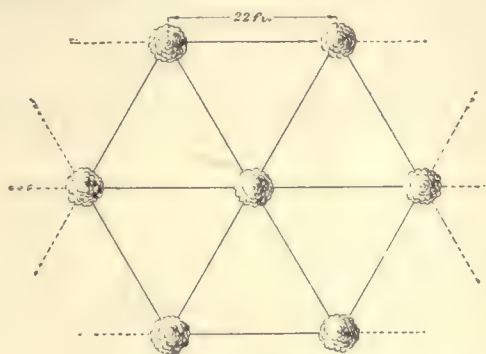


Figure VI.

likewise form hexagons, and when one includes the center tree of each hexagon they form groups of sevens. Hence the name equilateral, hexagonal, and septuple.

The chief advantage of this mode of planting in irrigated districts is that it provides three and often four different directions in which furrows may be run. Having the choice of so many, it is not difficult to select the one which is best for any particular tract. The ground can likewise be cultivated in more ways and about one-seventh more trees can be planted to a given area than is possible in the square method.

In the past the trees of irrigated orchards have been planted too close. This is made clear to even the casual

observer who visits the old orange groves of Riverside, Cal., the deciduous orchards of the Santa Clara Valley, California, or the apple orchards of the Hood River district in Oregon. Under irrigation systems peach trees should be spaced 20 to 22 feet, olive, pear, apricot, and cherry trees from 22 to 28 and 30 feet, orange trees 22 to 24 feet, apple trees 30 to 36 feet, and walnut trees from 48 to 56 feet apart.

On the Pacific coast the tendency toward wide spacing has induced many growers to insert peach fillers between other slower maturing trees, such as the apple and walnut. A common practice in this direction is shown in Figure 7, which represents the arrangement of trees in a young orchard in Douglas County, Wash. Here the trees are set in squares 18 feet each way, but in every other row peach trees alternate with the standard apple trees. In the remaining rows winesap apple trees are used for fillers. As the apple trees grow

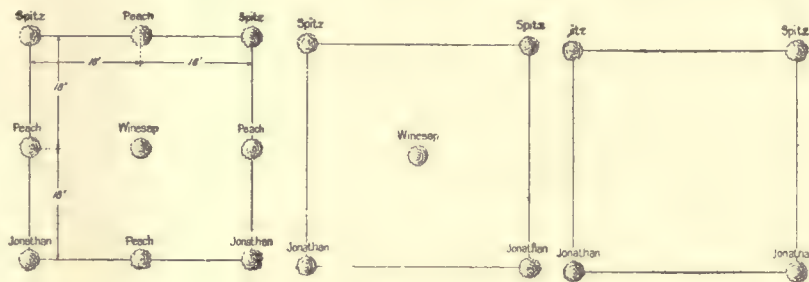


Figure VII.

Fig. 7.—Plan of planting apple trees with peach trees as fillers: A, Trees as planted at first; B, peach trees removed; C, Winesap removed.

and begin to crowd the fillers, the peach trees are removed. If more space is required the winesaps can be taken out, leaving the apple trees in squares 36 feet apart both ways.

(Continued in September number.)

MEXICO COMING IN FORCE.

THE best news that has come to the headquarters of the Eighteenth National Irrigation congress, Pueblo, September 26-30, concerning foreign representatives, is that the Republic of Mexico will be officially represented.

Secretary R. H. Faxon of the board of control of the congress has word from Dr. E. McQueen Gray of Albuquerque, New Mexico, the foreign secretary of the congress, to this effect. Dr. Gray, who is president of the University of New Mexico, has been working on this for some time.

Dr. Gray says he has a letter from Enrico Creel, secretary of state for the Republic of Mexico, saying the republic will have a fitting official representative.

This is cheering news at congress headquarters. There have been grave doubts as to the participation by Mexico officially. The diplomatic relations between the United States and Mexico have not been the best, nor have they between this country and South and Central America. Therefore Dr. Gray has had considerable doubt all along as to the outcome of his negotiations with those countries, and at no time has promised headquarters that any participation would result. However, in his usual emphatic and persuasive way, he has kept at it until he has won out in his efforts with Mexico.

Secretary of State Creel, to whom Dr. Gray refers, is one of the noted statesmen of Mexico. He was former governor of the state of Chihuahua, and at one time was Mexican ambassador to the United States. He performed some notable services at Washington. It was only a few months ago that he visited Washington as a special representative of his country and conducted some extremely delicate negotiations.

The congress officials are elated over the work of Dr. Gray and commend him highly. "It only shows how efficient he is in this position," said Secretary Faxon today.

Dr. Gray also says he expects to visit congress headquarters here about the middle of next month, when he will have further important news.

It is hoped the foreign representatives at Pueblo may run as high as 35, or possibly 40.

CIMARRON, KAN., NEW FIELD FOR IRRIGATION.

WITHIN the past year the eyes of those interested in irrigation have been turned toward Cimarron, Kansas, "On the New Santa Fe Trail." This thriving little city is the county seat of Gray county and is situated between Garden City and Dodge City, on the main line of the A. T. & S. F. Railway and on the great and fertile Arkansas valley.

The cause for the revival of irrigation here is the rehabilitation of the old Soule ditch under the supervision of the Arkansas Valley Irrigation & Construction Co.

The plan of this new ditch is tremendous in its scope and is based on a rather new plan. There are no pumps, although the water is taken direct from the Arkansas river underflow. There is no dam, or to be more accurate, the project is independent of any dam. The principle is simplicity itself. It is the sump canal or seepage system, by which the water is made to flow directly from the underflow by gravity out into the ditch. A long canal is dug parallel to the river. The underflow does the rest. The water percolates through the sands of the river bottom in vast quantities and flows in crystal stream into the canal which is merely a continuation of the ditch proper. The water is as clear and cold as that from a mountain spring.

Already a sufficient flow has been secured to irrigate 15,000 acres, although the sump canal is not more than

yards, telephone exchange, drug store, two or three restaurants and hotels, a couple of refreshment parlors, millinery stores, etc. Cimarron has on paper, the Jacksonian, which has been printed here for 26 years, and which has become known as one of the powers of western Kansas in boosting the fertile domain of the Arkansas valley. There are several enterprising real estate firms, lawyers, doctors and other lines usually found.

A visitor who once came to Cimarron, a newspaper man, wrote up his impressions upon returning to his home and he said, "Cimarron has class." That expresses it in a nutshell. Cimarron is unlike the ordinary country town. There are few false board fronts. There is a garage made of concrete which is modeled on the style of a public library. The tasty fitting of one of the department stores has already been mentioned. There is a large three-story hotel building which is modeled after the picturesque buildings of Italy and France, being of red brick with red hip roof. Cimarron has class. It is an individuality of its own. All the buildings are kept freshly painted and in good repair. From the freshly painted terra cotta colored schoolhouse with its green roof, on the hill, to the smiling valley of alfalfa patches below, Cimarron has class.

The opening of the new sump irrigation project is sure to attract the eyes of the world to Cimarron as nothing has before.

Already five or six farmers have signed up for water rights and are using the crystal underflow water on their



Panoramic View of

half finished. There is now no doubt whatever that the project is a grand success.

Cimarron lies on the gentle slope on the north bank of the Arkansas, and is one of the prettiest towns in western Kansas. It is heavily wooded and is one of the best kept towns in the state, having a complete curb system on the streets, many fine lawns and elegant residences, an electric lighting system and everything neat and well tended. The streets are dressed with a peculiar gypsum found in the neighborhood which makes a pavement equal to asphalt or macadam, being smooth and free from dust.

Two substantial banks take care of the financial welfare of the community, the Gray County State Bank and the Citizens' State Bank. The deposits are over \$200,000. The assessed valuation of the city is about a million dollars. The mercantile interests are so well taken care of here that Cimarron draws trade from a radius of from forty to fifty miles, or from five or six outlying counties. There are three large department stores, which are equal to most stores in cities of 5,000. One of them is finished entirely in mission style, with weathered oak stain, plate glass counters, cash carrier system, goods elevator, and metropolitan display windows. Another has a floor space of 80 by 100 feet.

There is one exclusive hardware store, two lumber

alfalfa, making it yield profusely. The community in the valley has a great future before it when the section is planted to truck gardens, cantaloupes, alfalfa, sugar beets, corn, grain, etc.

The wheat crop on the uplands of Gray county was very large this year, 1910, so it should not be inferred that this is too dry to farm without irrigation. In a strip two miles wide from the river to the south line of Gray county a man counted over 500 stacks of wheat, even though only about one-fifth of the land is under the plow. When it is all broken up great will be the returns. At this writing, August, corn is giving fine prospect, also broom-corn and feed crops.

LOSS BY EVAPORATION.

Where a right to the use of water is acquired through and by the construction of a ditch tapping any source of water supply, and the users thereafter elect to take the water thus diverted from other points on the stream, due allowance must be made for loss by evaporation, including such loss as may occur under different methods of use and distribution, which loss must, so far as practicable of ascertainment, be deducted from the quantity awarded under the original diversion and method of use. *Hough v. Porter*. Supreme Court of Oregon. 98 Pacific 1083.

Supreme Court Decisions

Irrigation Cases

TERMINATION OF WATER RIGHTS.

Revocation of a license to use a ditch does not terminate the licensee's water rights. *Ison v. Sturgill*. Supreme Court of Oregon. 109 Pacific 579.

ADVERSE USER.

The adverse, exclusive, continuous, and uninterrupted use of water from a stream for 10 years raises a presumption of title against an unasserted right. *Ison v. Sturgill*. Supreme Court of Oregon. 109 Pacific 579.

RIGHT OF WAY.

A letter acknowledging a request for a right of way for an irrigation ditch and stating "Go ahead. The more ditches you build, the better it will suit me"—granted a right of way, and not a mere revocable license. *Shaw v. Proffitt*. Supreme Court of Oregon. 109 Pacific 584.

RIGHTS OF LANDOWNERS.

The owners of land through which an irrigation ditch was maintained could not take water therefrom nor interfere with the appropriator's use of the water, even if the ditch was maintained under a revocable license. *Shaw v. Proffitt*. Supreme Court of Oregon. 109 Pacific 584.

APPROPRIATION.

When, for the purpose of diverting water for a beneficial use, a ditch is commenced, and within a reasonable time the work thereon is prosecuted to completion, the water turned into it and applied to the use therein, the right to the appropriation, to the extent of the quantity diverted and applied, relates back to the commencement of the work. *Hough v. Porter*. Supreme Court of Oregon. 98 Pacific 1083.

RIGHTS AS TO UNUSED WATER.

Whenever waters of a mill race appropriation were not in use, or were not needed to operate the mill, and were left in the stream, they were subject to appropriation and use by others during such times, at any point upon the river, either above or below the tail of the mill race, like any other unused or unappropriated waters of the stream. *Windsor Reservoir & Canal Co. v. Hoffman Milling Co.* Supreme Court of Colorado. 109 Pacific 422.

VOIDABLE ADJUDICATION OF WATER RIGHT.

Though defendants' ditch when a decree was entered adjudicating water right between them and plaintiffs would carry 3.2 cubic feet a second, and their land if irrigated would require that amount, if they had brought only 80 acres under irrigation so as to require only 1.6 feet a second, a decree adjudicating to them the right to apply a greater amount was voidable on proper attack. *Drach v. Isola*. Supreme Court of Colorado. 109 Pacific 748.

DAMAGES FOR DIVERSION.

The venue of a suit for damages for injuries to real estate



ct. Pueblo, Colorado.

PERCOLATING WATERS.

Where two or more persons own different tracts underlaid by porous material extending to and communicating with them all, which is saturated with water moving with more or less freedom therein, each has a common and correlative right to the water on his land to the full extent of his needs, if the common supply is sufficient, and to the extent of a reasonable share, if the supply is insufficient for all. *Hudson v. Dailey*. Supreme Court of California. 105 Pacific 748.

SUBTERRANEAN WATERS FEEDING A STREAM.

Where waters in an underground stratum are in such immediate connection with the surface stream as to make them part of the stream, defendant's land overlying the water is riparian to the stream and entitled to riparian rights with reference to such water. *Hudson v. Dailey*. Supreme Court of California. 105 Pacific 748.

WATER RIGHTS.

One may make an appropriation of water sufficient for the irrigation of land, the cultivation of which is then in contemplation, and it is not necessary that it all be applied the first year, but it must be put to a beneficial use within a reasonable time, and, when so applied, the appropriation will relate to the date of the diversion or the commencement of the work thereon. *Ison v. Sturgill*. Supreme Court of Oregon. 109 Pacific 579.

through the diversion of water of a stream, and for an injunction to restrain the diversion thereof, is not controlled by Const. art. 6, § 5, requiring actions to quiet title to real estate to be commenced within the county in which the realty is situated, but is controlled by Code Civ. Proc. 392, subd. 1, requiring an action for injuries to real property to be tried in the county where the real estate is situated, and the suit may be brought in a county though property injured is situated elsewhere. *Miller & Lux v. Madera Canal & Irrigation Co.* Supreme Court of California. 99 Pacific 502.

RIPARIAN RIGHTS—INJUNCTION.

The flow of the water in a stream was often insufficient to irrigate the land of a riparian owner. The annual rainfall was slight, and, unless irrigated, the land was unfit for cultivation. Overflow water, occasioned by floods, yearly deposited on the land fertilizing materials, increasing its productiveness and enhancing its value. The water overflowing the land was of great benefit to the riparian owner, and, if the flow of the waters was taken away, the land would become arid. Held to show that irreparable injury would result to the riparian owner if the diversion of such waters was accomplished, and authorized equity to interfere by injunction restraining such diversion. *Miller & Lux v. Madera Canal & Irrigation Co.* Supreme Court of California. 99 Pacific 502.

WORK AT HOLLY, COLORADO.

A Great Community, Reclaimed from the Desert, Now Thriving and Prosperous, with Happy Residents.

HOLLY, Colorado, is located in the far famed Arkansas Valley in the east end of the state. This town, sprung in the last twelve years from a barren waste, bids fair to be one of the best towns in the eastern part of Colorado, in the near future. Holly, besides being on the main line of the Santa Fe, is also the terminal for the Arkansas Valley Railroad. This latter road was built through the farming districts lying along the north side of the Arkansas River, and extends from Holly to Rocky



The Public School, Holly, Colo.

Ford. The hundreds of thousands of acres of irrigated lands through which the road passes have been divided into small farms, and the Arkansas Valley traveller is impressed with the density of the population.

To make ready markets for this thickly settled farming country, towns have sprung up in the past two years on the Arkansas Valley road and Hartman, Bristol, Wiley, McClave, Cheraw and others, all have their name on the list of Colorado's thriving towns. Motor cars have now been placed on the Arkansas Valley road, thus giving the farmers and residents of these small towns easy access to Holly, the capital of this territory and market center for its thrifty people.

Holly is the headquarters of the Arkansas Valley Sugar Beet and Irrigated Land Company. This company developed the great irrigating system adjacent to Holly, and originally owned the 80,000 acres of land watered by this system. The reservoirs which hold the storage waters to supply this land are the largest of their kind in the country. They cover 13,000 acres of land and contain 182,000 acre-feet of available water. Is it any wonder the farms of this territory produce the maximum returns per acre that it is possible to obtain from irrigated lands.

About 50,000 acres of the original 80,000 have been sold. The development that has come to Holly from the settling up of the 50,000 acres leaves little room for doubt that when the remaining 30,000 acres are settled, Holly will have more than doubled in size and importance. These lands are on the market now and are rapidly being settled up.

Holly is also headquarters for the Holly Sugar Company, which owns a factory at Holly capable of slicing 600 tons of beets per day and another at Swink with a capacity of 1200 tons per day. The Holly Sugar Company built the Arkansas Valley Railroad, for the purpose of giving the beet raisers an easy market for their crops.

Here are some concrete facts about Holly:

Altitude 3,400 feet—just right for health and comfort. Population, 1,500 and rapidly increasing.

On the main line from Chicago to California on the

Santa Fe Railroad. It is the Eastern terminal for the Arkansas Valley Railroad with sixteen passenger trains daily.

Owens modern water works, the best water in the Arkansas valley.

Owens a modern electric light plant.

Owens a modern sewerage system.

It has concrete sidewalks on all its streets.

Its schools are the best; accredited with all the colleges in the state. Four churches: Presbyterian, Methodist, Baptist and Catholic. Fraternal organizations are well represented.

Holly has an opera house, two newspapers, two banks (deposits \$250,000), beet sugar factory employing 210 men, ice plant, telephone system (700 subscribers), three automobile garages, more than seventy-five business firms. A modern passenger station to cost \$15,000 is under construction.

Holly is an important center for cantaloupe shipping. Holly cantaloupes top the market. Hundreds of cars of alfalfa and millions of pounds of sugar are shipped from Holly every year.

There are splendid opportunities for business locations at Holly, and the Holly Commercial Club is on the job to help anyone desiring to investigate any of Holly's many advantages.

WATER IN SALT RIVER VALLEY.

FARMERS in Salt River Valley, Arizona, are rejoicing in the approaching completion of Roosevelt Dam. The water stored behind this structure has already saved this year's crops from what probably would have been complete destruction from drouth. The normal flow of the river is lower than at any time during the last six years, and stored water to the extent of about 46,000 acre-feet was drawn from the reservoir during June. Up to July 1, a total of \$38,706.95 had been received from the sale of water. More than 130,000 acres are now under irrigation.

There is great activity in the valley in the sale of farm property. The sales run from 2½ acre tracts to quarter and half sections. A number of large tracts have been subdivided into 5, 10, 20 and 40 acres and are being disposed of to homeseekers. The value of lands at the pres-



Main Offices of the Arkansas Valley Sugar Beet & Irrigated Land Co., and the Holly Sugar Company. Located at Holly, Colo.

ent time under cultivation ranges from \$75 to \$500; raw lands from \$60 to \$250. The latter priced land of course, is that suited to the growing of citrus fruits. The value of cultivated lands at the time the project was initiated was \$40 to \$150 an acre, and raw land \$10 to \$50.

Agricultural conditions at the present time appear to be in excellent shape, prices for farm products being uniformly good. New hay is selling for \$10 a ton, and new rolled barley at \$1.25 a hundred weight. Various lines of business in the towns throughout the valley is also good, failures in mercantile lines being practically unheard of.

HAPPY FARMERS IN FOUNTAIN VALLEY

IN a beautiful valley 13 miles south of Colorado Springs, Colo., lies the Fountain Valley Project, under the ownership of the Fountain Valley Land and Irrigation Company which is attracting more attention perhaps than any other project of similar size in the west.

The soil in this valley is deep, rich and needs only water to make it productive of great wealth. During the past three years ranchmen on this fine tract of land have thoroughly demonstrated the fact that large crops of grain, alfalfa, beans, potatoes and in fact everything that will grow on good land can be produced here.

The water supply is much more than the land will require and the system is capable of covering a far greater area than is now supplied. A correspondent of THE IRRIGATION AGE who has just returned from a trip over those lands, writing under date of August 3, says: "Rainfall to the depth of more than three inches covered this section of the country last week and it will not be necessary to use water from the reservoirs for some time to come. Crops of beans, beets and garden truck of all kinds are in fine condition and the yield promises to be large. All farmers who are paying close attention to their crops are sure to get good returns this year. The irrigation



Members of the Board of Engineers. Officers of the Army Who are Examining the Reclamation Service Projects of the West. Major Harry Burgess, Major Wm. W. Harts, Major Chas. W. Kutz, Lieut.-Col. John Biddle, Lieut.-Col. Wm. C. Langfitt.

system on this tract is proving all and more than has been claimed for it and has demonstrated the fact that the storage system is the one that must eventually be adopted by the irrigation companies in the west. While many of the oldest direct systems in Colorado have suffered somewhat from shortage of water this year, it being the driest year known for a decade, the Fountain Valley lands have all the water, and more than can be used for its crops."

Mr. George F. Washburn, County Judge, at Aurora, Neb., a man well and favorably known throughout the west, has great faith in the Fountain Valley system and writes the following letter in regard to it:

"After careful investigation of the various fertile valleys of Colorado, I very carefully looked over the lands owned by the Fountain Valley Land and Irrigation Company, and on July 18 last, purchased from the company 80 acres near Fountain River. Since this purchase I have traveled more than 1,000 miles in the state of Colorado and during that journey there has been presented to me many opportunities for investment, but in my judgment the proposition offered by this company is by far the best of all and is most certain to bring large returns. My reasons are that the soil is rich and productive, the company owns and operates an excellent irrigation system with sufficient storage reservoirs and plenty of water to take care of all their lands. This land is located on four

main lines of railroad in the best civilization in the state, with a regular and constant market close at hand for everything produced at practically Chicago prices. From the appearance of the crops now growing on the company's lands I am satisfied that with proper cultivation one can purchase a tract of this land and make it pay for itself in crops of wheat, oats, alfalfa, potatoes, beets, beans and other vegetables and small fruits and at the same time enjoy a residence in one of the most delightful climates in the United States and in sight of the grandest and most marvelous scenic wonders of the world."

Settlers can buy land in this tract today at prices ranging at \$115 per acre upward. This price, of course, includes full water rights, the only extra charge being the small maintenance fee each year which is incident to all irrigation development.

Farmers and others who contemplate the purchase of land in the west will be interested in the large number of letters from actual settlers who have made their home in Fountain Valley and we suggest that they will receive not only copies of these letters, but other most valuable information by writing to the Fountain Valley Land and Irrigation Company at Colorado Springs, Colo.

TO PROTECT THE IMPERIAL VALLEY.

AT the last session of Congress \$1,000,000 was appropriated for the work of restraining the Colorado river and protecting the Imperial Valley and every effort will be made to use this money for this purpose before the fall rains set in. The ranchers in the Imperial country recently appointed a commission of engineers to investigate the situation and they have reported that conditions are at work in the river below the international boundary and gradually working upward, and will, it is believed, in a short time lower the bed of the stream at least twenty feet. This would certainly destroy the Government dam at Lake Laguna and prevent an irrigation system on either side of the river.

The Colorado river has cut a new and shorter channel into the gulf, the new route to the ocean taking it via the channel of the Abejos river in Mexico. By this shorter course the river has a more abrupt fall to the level of the sea and the swift current thereby created is cutting back or scouring the bed of the stream, thus rapidly lowering the river bed. If it continues it will lower the river some twenty feet at the intake of the Imperial Irrigation System and thus make it impossible to divert the water into the canal. Whether the same system of cutting back would in time lower the river bed a long distance up stream to the extent of reaching the Laguna dam and undermining it is a question for engineers. As the dam is some fifteen miles above Yuma, the engineers report that according to their best belief the dam is in no immediate danger and may not be for a long time.

Meanwhile a menacing situation undoubtedly confronts the Imperial Valley. How long it may take the river to scour out its channel of silt and drop below the head of the Imperial Canal is a problem, and the engineers are not prepared to make an official prediction as to this point, but privately they expressed the opinion that this will probably occur some time next winter if the erratic conduct of the river continues. Two protective courses are open. One is to close the break into the Abejos river by a dam with a levee many miles in length to confine the river to its old channel. A levee five or six miles in length would be required at once in connection with the channel that leads into the Abejos river and ultimately there would have to be a levee probably twenty-five miles long to hold the river to its former channel. This would cost an immense sum of money and the Southern Pacific Road and the Government will have to join hands in order to provide it.

Since part of the threatened territory lies in Mexico an international commission to deal with the matter has been suggested. President Taft recently had a conference with W. H. Holibird, receiver for the California Development Company, and has also talked with army engineers as to the best means of controlling the river and protecting the great Imperial Valley. It is expected that President Taft will appoint a commission very soon and invite Mexico to join in the work.

THE ARNO IRRIGATED DISTRICT.

IN the Pecos Valley of Texas there lies a great district which is remarkable, not for its size nor its magnitude, but more for the completeness, stability and perfection of its construction and the fact that the system itself has been entirely completed without asking for the aid of the public and before an acre of land has been placed upon the general market. This fact is so unusual in the development of irrigation enterprises that it is worthy of special notice.

The dams, main canals, principal laterals and head gates of the Arno district are all constructed and water is now running through them. It takes its water direct from the Pecos Valley through a gravity system and by means of a diversion dam. Sixteen thousand acres of extremely rich land lie in almost equal portions on each side of the Pecos Valley branch of the Santa Fe Railroad that leaves the main line at Wellington, Kas., and extends in a south-westerly direction through Kansas, Oklahoma, the Pan Handle of Texas and the Pecos Valley of New Mexico and Texas, having its terminus at the city of Pecos, Texas. This is the first system of any importance south of the Government works of irrigation of New Mexico. The

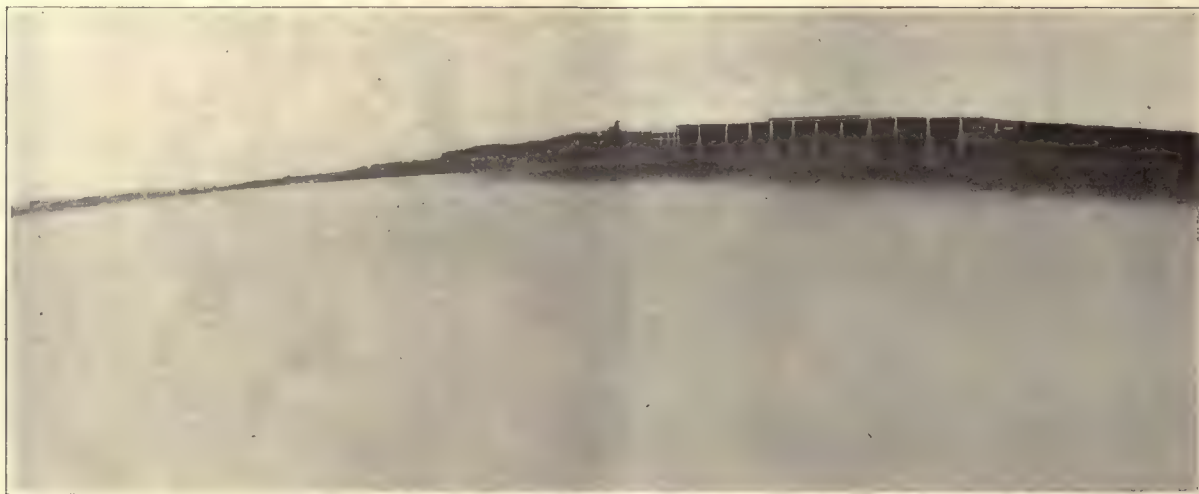
The town is growing rapidly and has daily passenger trains, daily mail, telegraphic and express offices and churches and school buildings of the most modern character are now being planned. The Eastern offices of the Arno Irrigated Land Company are at 1210 Ft. Dearborn Building, Chicago. The main offices are at the Oriental Hotel Annex, Pecos, Texas, and at Arno, Texas.

ROCKY FORD'S GREAT EXHIBIT.

WHILE various sections of the state of Colorado are vying each other for supremacy in the character of their exhibits for the National Irrigation Exposition, September 19-October 1, Pueblo, in connection with the Eighteenth National Irrigation Congress, September 26-30, and trying to be foremost in preparing the same, Rocky Ford, in the Arkansas valley, has practically got its exhibit all arranged.

W. W. Kearney is director of the local exhibit at Rocky Ford, and he is now proudly exhibiting his showing for the big event at Pueblo. He has it put away in a good safe place at Rocky Ford, and shows it off to strangers each day.

There are 35 different displays of grasses, all tastily



Headgates of the Arno Canal. At this point the canal taps the Pecos River and carries the water 15 miles to the waste-way, where the water is turned back to the river with a fall of 60 feet.

system is constructed in the best possible manner and has been approved by the best engineers obtainable.

It is owned by the Arno Co-operative Irrigation Company and has no bonded indebtedness, no mortgage or debts of any kind except its current bills. Every man who becomes an owner of an acre of land under the Arno system becomes part owner in it and gets his water deed and will get his proportionate stock in the system which will be owned by the owners of the land.

The entire system will be operated by the stockholders and such expenses as will be incurred will be voted by the stockholders for the maintenance of the system just the same as they would vote any tax for a public enterprise in which all citizens are interested. The water supply can never be exhausted and there is no 40-acre farm in this vast tract more than two miles from a railroad or more than three miles from a railroad station. All of these lands are adapted to the use of modern machinery, and it is a fact that more modern machinery is used here than is to be found in the old and settled communities in the main district.

The country is especially adapted to stock raising and the farmer has practically unlimited range. Just across from the main canal lie hundreds of acres of range land on which his cattle, horses and sheep may live, and thrive the year around without feed. Hogs can be raised on alfalfa in this country cheaper than in the corn belt.

The principal town in this district is Arno, 20 miles north of the city of Pecos. Lots are now being sold to settlers at prices ranging at from \$50 to \$500 per lot.

arranged, and all showing off Otero and Rocky Ford district possibilities to good advantage. There are 15 varieties of wheat, oats, and barley, of flax and of alfalfa.

There are also, melantus, timothy, orchard grass, wild rye, clover, millet, speltz and various others.

Besides, Rocky Ford has exhibits of its famous fruit and truck, and will have still other features in its splendid showing at Pueblo.

Meanwhile, the country to the north of Rocky Ford, on the Missouri Pacific main line, is not behind, and is spending a good deal of money under the direction of experts to arrange suitable exhibits that will prove the efficiency of the soil and climate of the famous Olney-Ordway-Sugar City district.

Holly has spent a good deal of money, mostly for local prizes for fine exhibits, and is rapidly collecting the various items into one big, fine exhibit. Lamar and other places are doing the same.

On the western slope, there is the same activity, principally as to fine fruit displays, and in the San Luis valley, a meeting of the San Luis Valley commercial Association this week will take definite steps toward a comprehensive demonstration on the part of that section.

Northern Colorado is also manifesting interest, and will not be found wanting, letters daily received here state.

The rivalry of Colorado sections over the exposition also enhances the Irrigation congress, and insure fine attendance from all over the state at both the big events in Pueblo the last two weeks of September.

Raising Crops



in the
San Joaquin Valley
California

will make you independent.

The ambitious man or woman who wishes a home, friends, a comfortable living, and money in the banks to insure against future want, will find in the San Joaquin Valley what he is looking for

Here are 10,000,000 fertile acres, with an abundance of water for irrigation coming from the ever present snows of the High Sierras. The clear, warm California sunshine compels a sturdy, healthy plant growth. **Every staple crop is profitable here.** Nature is on your side. All that you need is reasonable industry and success is certain.

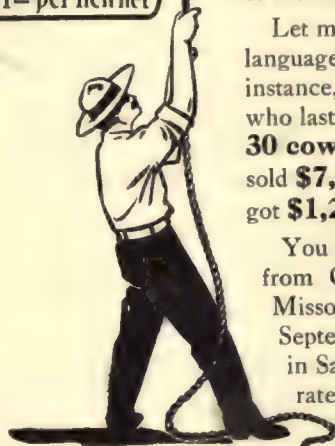
The man of small capital can get quick returns from vegetables, alfalfa, hogs, dairying and poultry. A few acres intelligently handled will support a family while the orchard and vineyard is coming into bearing.

If it were possible for you to meet and talk with the hundreds of men who came to the valley with little and who now are prospering, as I have done, you would be as enthusiastic as I am over the future of the country

Let me send you a 72-page book, telling in plain language what others are doing and have done. For instance, it tells of Mr. S. W. Williams, Tulare, Cal., who last year sold **\$3,000 worth of milk from 30 cows**; of Mr. C. S. Baxter, Merced, Cal., who sold **\$7,200 worth of milk from 60 cows** and got **\$1,200 for his surplus alfalfa.**

You can go to California this fall for only \$33 from Chicago, \$32 from St. Louis, \$25 from Missouri River, if you start any day, August 25 to September 9 or October 1 to 15. Tickets honored in Santa Fe Tourist sleepers on payment of berth rate. If you ask for it, I also will send you our journal, *The Earth*, free for six months.

Alfalfa	\$50 acre
Oranges	\$300 acre
Peaches	\$150 acre
Grapes	\$100 acre
Vegetables	\$250 acre
Dairy	\$100 acre
Figs	\$125 acre
Poultry	\$1 ⁰⁰ per hen net



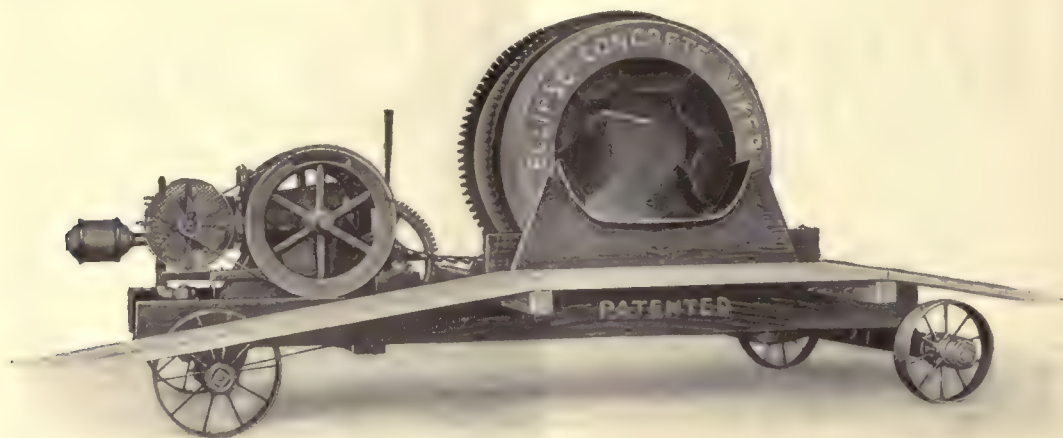
Chas. L. Seagraves, Gen. Colonization Agent, A. T. & S. F. Ry. System, 1110 Railway Exchange, Chicago, Ill.

LOW CHARGING MIXER.

THE Eclipse Concrete Mixer manufactured by The Standard Scale & Supply Co. of Pittsburgh, Chicago, Philadelphia and New York has gained so in popularity that the manufacturers have had to enlarge their plant in order to meet the demand for mixers. They had sold in the first few months of this year more machines than the whole of last

ket. The charging platform is only 24 inches high and is that the mixer is moving, having four streams continually portable with the outfit, thus eliminating all high wheeling and

The drum, which is of the heaviest material, is cylindrical in shape, having blades and deflectors so arranged that the material is cut and divided and thrown over every second the expense of tearing down and rebuilding the platform every time the mixer is moved.



season. The United States Government has purchased several, also several of the large railroads and largest contractors. One large contracting concern purchased a car load after testing their first machine.

The Eclipse is the only low charging mixer on the mar-

pouring into each other. The front of the drum is entirely open, allowing the operator to see the entire batch while it is mixing and can determine whether the batch is too wet or too dry without discharging same.

A series of circularly arranged blades located at the

TURN ALFALFA INTO BEEF AND MUTTON



The irrigated lands at Uva, Wyoming, offer the best mixed farms and stock finishing in all North America. They grow anything that will grow anywhere in the Middle West, but stock feeding pays best. *Hay and grain turned into meat multiply the money.*

Only a few hours from Denver, on the new through line between Seattle and Galveston. Big yields of everything, especially alfalfa and sugar beets. Quick markets. \$37.50 to \$60.00 per acre. Ten years for payment. Plenty of farm help. Good schools. Telephones. R. F. D.

There are hundreds of miles of *Government range lands* close by, *free to all*, where farmers run their cattle and sheep nine months in the year. Two or three months' feeding at the home farm on home-grown alfalfa and grain finishes them for market.

They are all making money there. Better homes, better climate, less work and more profit than in the Middle States. Look into the facts. Write us or call, straight away. It's your move.



O'NEILL
LAND COMPANY
AGENTS
1202 Marquette Bldg.
CHICAGO

charging end of drum makes it impossible for the concrete to slop out no matter how sloppy it may be.

The discharge, which is semi-automatic, can be operated from either the charging or discharging end. This is a feature no other machine has. The discharge chute is high enough from the ground to permit of wheelbarrows or carts to be placed under same. It is furnished with any kind of power to suit the customer, such as steam, gas or gasoline engine, electric or compressed air motor.

The whole outfit is mounted on a substantial truck with wide rimmed wheels. All working parts are housed and all bearings furnished with grease cups. It is the simplest, strongest and most portable outfit on the market. The drum is carried on four rollers, thus taking the weight off of the gears and is driven by two gears instead of one, thus giving twice the wearing quality as compared with other machines. The manufacturers back it up with a guarantee to save 20 per cent in labor. The accompanying illustration shows the charging end of mixer mounted with gasoline engine and housing removed. Anyone desiring further information or price may secure same by addressing any of the following addresses: 1345-47 Wabash avenue, Chicago, 243-245 Water Street, Pittsburgh, 35 South Fourth street, Philadelphia, 136 West Broadway, New York.

A NEW PRINCIPLE IN STEEL FORMS.

THE Miracle, Collapsible Steel Forms comprise a fundamentally good idea, carefully worked out, tested and tried under conditions of actual use and found to be all that the inventors hope for in the construction of culverts, sewers and conduits in concrete. These forms reduce the first cost of concrete culverts and take the place of the wood culvert wherever good road building is practiced. Corrugated metal culverts have had their day and the Collapsible Steel Forms are already working a revolution in all underground concrete work. The principal features of these forms is that they are smooth, level and without ridges and are practically everlasting. Any number of forms can be used, according to the requirements of the stream to be crossed.

These forms are now being used in large numbers in those states where good road building is recognized as a vital necessity in the development of the country and the large number of highly commendatory letters received from public officials in those states are the best evidence of their great value.

Parties interested should address the Miracle Pressed Stone Company, Minneapolis, Minn.

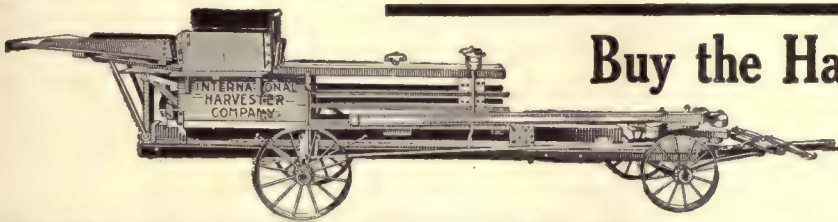


HOW IS THIS FOR HIGH? OAT FIELD NEAR ST. ANTHONY

Irrigated Crops Never Fail

The Upper Snake River Valley in Idaho has the Soil, the Sunshine and the Water. More than fifty large canals now completed and owned by the farmers of our county. Guaranteed water rights sufficient, with lands that yield 6 tons of alfalfa, fifty bushels of wheat, 100 bushels of oats, 600 bushels of onions or potatoes, and 20 tons of sugar beets per acre. Fine Climate. For information and illustrated booklet write

C. C. Moore Real Estate Co.
ST. ANTHONY or ASHTON, IDAHO



Buy the Hay Press That Pays For Itself In the Shortest Time

THERE is no question but that you should bale your hay, whether you are going to feed it on your farm or sell it. There is always a ready market for baled hay. It brings top-notch prices—is easy to handle—occupies less space—keeps fresh, sweet, and free from dust. Baled hay well kept is worth from 25 to 50 per cent more for feeding purposes than loose hay exposed to the weather. There is no waste with baled hay.

But—If you pay someone else to bale your hay for you it eats up your profit.

An I H C Pull Power Hay Press

will pay for itself by the saving it makes the first year if you raise an average amount of hay. With it you can do your baling at odd times with your own help and save the expense and delay of having it done by a customs press.

The I H C hay press is simple, well constructed, and exerts greater pressure with the same amount of power than any other press of equal size. It is easy on the horses, light in draft, durable, satisfactory.

I H C hay presses are operated by horse power or gasoline engine. The one-horse press has 14x18 in., bale chamber: the two-horse press has 14x18 in., 16x18 in., or 17x22 in. bale chamber. The International motor baling press is furnished with 14x18 in., 16x18 in. or 17x22 in. bale chamber, and 3, 4, or 6-horsepower I H C gasoline engine.

One of these strong, right-working, fast-baling presses will save all of your hay in the best possible condition.

When you have the time, you can add to your income by doing work for your neighbors.

Call on the International local dealer for a catalogue and full particulars, or, write nearest branch house.

WESTERN BRANCH HOUSES: Denver, Col.; Helena, Mont.; Portland, Ore.; Spokane, Wash.; Salt Lake City, Utah; San Francisco, Cal.

**INTERNATIONAL HARVESTER
COMPANY OF AMERICA**
(Incorporated)
Chicago U S A



**THE
I-H-C LINE**

LOOK FOR THE I. H. C. TRADE MARK. IT IS A SEAL OF EXCELLENCE AND A GUARANTEE OF QUALITY

When writing to advertisers please mention The Irrigation Age.



No. 3. Traction Gasoline Machine crossing the high Sierras of Eastern Washington, where fuel and water are not to be had. We made the 25 mile move in 8 hours, using 20 gallons of gasoline at 19c per gal. We had no team nor needed any. The one in the picture did not belong to the machine.

THE DESERT DRILL

This is a Standard KEYSTONE Traction Cable Drill driven by a two cylinder double opposed gasoline engine. Size 3 has a 22 H. P. engine and is guaranteed for 500 ft. depths. Size 5 has a 30 H. P. engine and is guaranteed for 1000 ft. with manilla cable or 1500 ft. with wire line.

Requires no fuel but gasoline.

Requires no water except for cooling engine and a little for the hole.

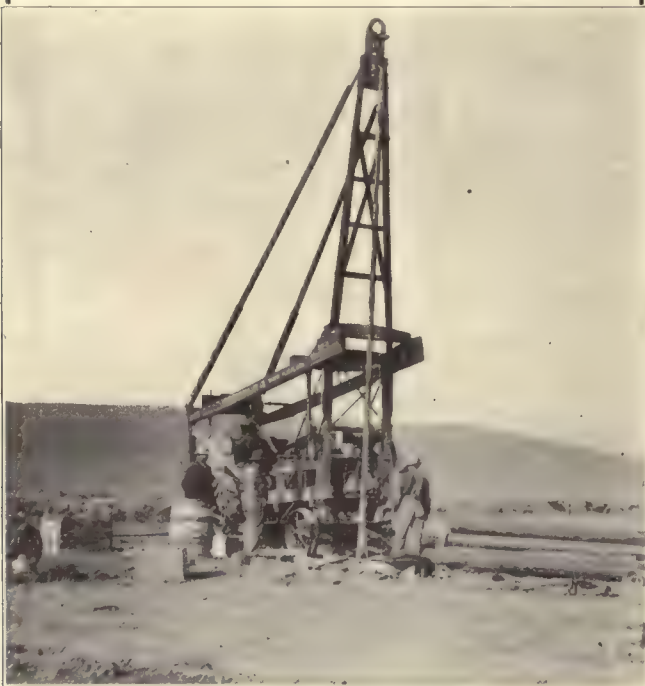
Will go anywhere on its own power.

Ask for Bulletin No. 7

KEYSTONE MOTOR DRILL WORKS

Beaver Falls, Pa.

No. 3 Traction Gasoline Drilling in Eastern Washington, using 500 ft. of 2 1/4 in. cable and cutting 10 in. hole. Has 28 ft. string of tools with 3 1/4 x 22 ft. stem. This drilling was all hard basalt boulders and our best day's work was 50 ft., using 15 gal. of distillate at 13 cents per gallon.



NEW YORK STATE INTERESTED.

THE formation of "Agricultural Improvement Association of the State of New York," with noted railroadmen, publicists, Eastern boosters, and farseeing citizens generally, with the adoption of the National Irrigation Congress' "home-making on the land" motto, is a movement that is likely to produce a substantial delegation from New York at the Eighteenth National Irrigation Congress, Pueblo, September 26-30.

Word of this organization in New York was conveyed immediately to Secretary Arthur Hooker and other congress officials here, and the assurance given that there would be representation from the new movement at the big congress here next fall.

This organization was formed at a recent meeting held in New York City, addressed by Secretary James Wilson of the United States department of agriculture and proceedings of the conference will shortly be issued. Welding Ring, president of the New York Produce Exchange, was one of the movers in the campaign, and has written Secretary Hooker expressing his desire to cooperate with the National Irrigation Congress in its development work.

President W. C. Brown of the New York Central lines is another interested person in this movement, and he has also written Secretary Hooker relative to the matter. Mr. Brown was invited by the board of governors of the National Irrigation Congress to address the Eighteenth sessions at Pueblo, September 26-30, but writes that he expects to be in Europe at the time and cannot accept the invitation. He expresses his good wishes, however, for the congress, and says there should be close cooperation in all endeavors along improvement and development lines that have to do with better agricultural conditions throughout the country and especially in the East.

Vice-President George T. Nicholson of the Atchison, Topeka & Santa Fe is also interested in this cooperation and cites approvingly the work of the colonization and industrial departments of his road. Mr. Nicholson has been appointed a delegate to the Eighteenth congress by Governor Deneen of Illinois, and will make an endeavor to be present.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 280-page finely illustrated work for new beginners in irrigation.

A BARGAIN

A 40 acre cultivated farm near Colorado Springs, Colorado. 1/4 mile from town; traversed by 5 lines of railroad. Near School and Irrigation Age farm. Fine for fruit truck.

Address J. E. P., care IRRIGATION AGE,
112 Dearborn St., Chicago, Ill.

The Chas. T. Manning Realty Co., Ltd.

SOLE SALES AGENTS

The Gooding Townsite Company, Ltd.

RESIDENCE LOTS.

BUSINESS LOCATIONS.

Improved—Irrigated Lands—Unimproved.

GOODING, IDAHO.

Reclamation Notes

CALIFORNIA.

An injunction has been issued to Wm. Wentz, B. F. Holenbeak and W. J. Albaugh of Redding, against M. J. Barum and B. F. Helfrigh. The plaintiffs allege that they have used 311 inches of water of Pitt river for thirty-five years, and that the defendants are depriving them of the use of this water and appropriating it for their own use. The injunction, which is a temporary one, restrains Barum and Helfrigh from interfering with the irrigating ditch, and will be made permanent if the defendants do not show cause to the contrary.

The Tulloch irrigation system has been transferred to the South San Joaquin and the Oakdale Irrigation Districts, each of which paid \$325,000 for the property. They will own and operate it jointly. The system supplies water to a portion of each district, and controls valuable water-rights in the Stanislaus river. New systems will be constructed by both districts, using as much of the old canals as may be feasible, and a joint dam will be built across the Stanislaus river above Knight's Ferry. Bonds to the amount of \$459,000 have been issued and bear 5 per cent interest.

Messrs. Wooster and Sanborn, representing the Solano-Yolo Land and Water Company, of San Francisco, visited Winters recently and laid plans for a new irrigation canal to extend from Putah Canyon through the Wolfskill and McMahon tracts and thence to Dixon and Elmira. This will place all lands between Elmira, Dixon, Tremont and Winters under an irrigation system. The company will construct two reservoirs, one in Coyote Valley and one at the Devil's Gate in Putah Canyon. Water will be taken from Putah Creek, about seven miles west of Winters, on the Solano side.

M. N. Sheldon and Geo. W. Harney of Marysville have purchased the Peter Kerrigan ranch near Encinal, Sutter County, for \$20,000. This ranch will be cut up into small tracts and placed under an irrigation ditch.

Suit has been filed against the Sacramento Valley Irrigation Company by Logan Cecil of Willows, Glenn County, in which he seeks to have the court restrain the irrigation company from building canals and ditches which will empty water into Willow Creek. Cecil claims that the overflow of the creek, through the work of the company, has damaged his property to a large extent.

E. H. Mecum has installed a four-inch centrifugal pump at the Mecum and Papst orchard just south of Orland. The water is pumped from a well seven feet in diameter. This well furnishes water to irrigate a 20-acre orange and lemon orchard.

Papers have been filed with the county recorder at Red Bluff by the Sacramento Irrigation Company, organized under the laws of Oregon, whereby the use of 80,000 inches of flowing water in the Sacramento River is claimed. This water is to be used in operating a pumping plant to divert water from the river for the purpose of irrigating lands in the Antelope Valley east of Red Bluff. The company also claims 5,000 inches of water for irrigation purposes, to be used in irrigating the lands above mentioned.

Len A. Walton, a fruitgrower near Yuba City, is boring a deep well on his place for irrigation purposes.

Idaho Irrigated Improved Farm Bargain

713 acres finest soil, all level, tillable, old decreed water rights. Ideal alfalfa, stock and fruit locality. Railroads close range. Terms, write BOX 85, HAILEY, IDAHO.

The Twentieth Century Irrigation System

OR

The System of the Future

THE ONLY ONE OF THE KIND IN COLORADO

Water conducted onto land entirely through pipe lines.

105 feet of Beaver Creek water rights.

Three miles of main pipe line, 42 inches in diameter, made of 2 inch Oregon fir lumber, with $\frac{5}{8}$ " steel bands every 4 to 6 inches.

37 miles of cement pipe laterals, from 8 to 24 inches in diameter, laid 18 inches underneath the ground, preventing seepage, evaporation, distribution of weed seed, breakage of ditches, and keeping the water pure and cool. You can cultivate right over them.

Schaeffer Reservoir, holding 5000 acre feet of water.

IS BACK OF

The Beaver Park Fruit Lands

In buying irrigated land the first thing to be considered is the irrigation system itself. Why not get the best while you are getting?

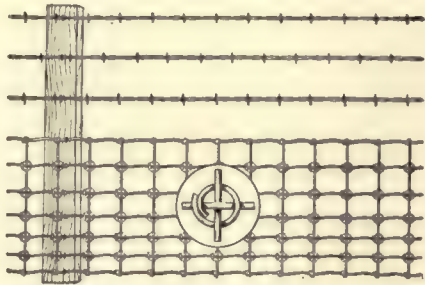
We have unimproved land; also growing orchards from one to two years old. Prices from \$200 to \$400 per acre. The greatest values in Colorado. Easy terms. Ten years time on unimproved land, in equal payments. Growing orchards, \$1000 to \$2000 down on a ten acre tract, balance yearly until paid.

Beaver Park land has increased in value over 100 per cent during the past two years. It is going to do the same thing in the next two. Own a FRUIT FARM and be independent for life. Write for literature.

The Beaver Land & Irrigation Company

PENROSE, COLORADO

PEERLESS FENCE



is made in a wide range of styles to meet all possible requirements.

The highest grade on the market

Catalogue on Request

PEERLESS FENCE CO.
ADRIAN, MICH.

F. H. Vogle of Wellington, Nev., and San Francisco, together with a party of California and Pennsylvania capitalists, has planned to reclaim 8,000 acres of land in Smith Valley. The company backed by these men has already sufficient water and has some land under irrigation, and by enlarging its reservoirs and irrigation canals it will be able to irrigate the vast acreage to be opened up in a short time.

The Surprise Valley Power & Irrigation Company of Fort Bidwell has let the contract for the boring of a large tunnel to carry off the waters of Cowhead Lake in the northeast part of Modoc County for power and irrigation purposes. Thousands of acres of land in Surprise Valley will be brought under cultivation. Chief Engineer Fox of the Surprise Valley Power & Irrigation Company is now engaged in making a survey of the ditch line, and of the country which it will cover. The cost of the power and irrigation project is estimated at \$250,000. This project is the first large power proposition in Modoc County and the residents of the valley are enthusiastic over it.

COLORADO.

The Interior Department has withdrawn 30,000 acres of public lands in western Colorado from homestead entry, and all other forms of disposition under the land laws. This area is located in the vicinity of the Grand Valley reclamation project and is thought to be susceptible of irrigation by that system.

The large dam of the Teller Land & Irrigation Company on Turkey Creek, twenty miles northwest of Pueblo, was washed out on July 24th, and damage to the extent of \$50,000 was reported.

The State Land Board adopted a resolution directing the attorney general to notify the Colorado Land & Supply Company of Denver that unless it makes good and

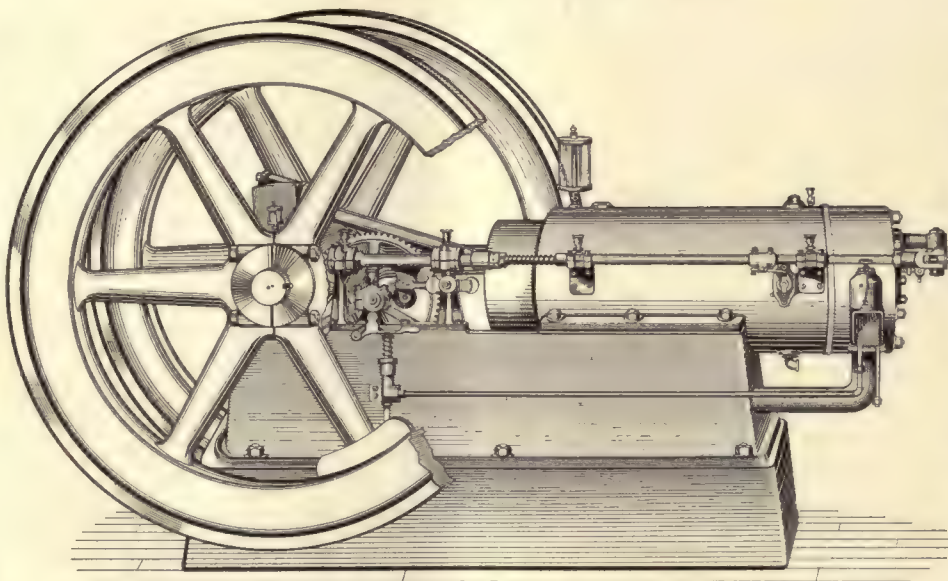
THE RELIABLE LINE "DEMPSTER"

We make 1½, 2½, 3, 6, 8, 12, 15 and 20 H. P.

High
Grade
Gasoline
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Built for
Exacting
and
Enduring
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Best
for
Irrigating
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Cut shows our 15 H. P. and 20 H. P.

Write
for our
Booklet
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1910
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It will
"Show
You"
what we
can do
for you.

DEMPSTER MILL MFG. CO., Factory, Beatrice, Nebr.

BRANCH HOUSES
OMAHA
KANSAS CITY
SIOUX FALLS

places water on its lands by September 10th, the board will consider that it has forfeited its contract with the state. This is what is known as the Ignacio project.

A. B. McFall, civil engineer for the Hardscrabble irrigation district, comprising 13,000 acres, near Florence, has completed the preliminary survey of the system and has estimated cost for putting water on the land at \$62 per acre.

The board of directors of the Mammoth Irrigation District have ratified a contract with the Purgatoire Development Company, providing for the acquirement by the former of three-fifths interest in the latter, thus making certain the building of reservoirs and canals which will place under irrigation about 85,000 acres of land, much of which is situated about 15 miles north of Lamar. The entire cost of placing the water upon this land will not exceed \$40 per acre. Twenty-year bonds, amounting to \$3,500,000, bearing 6 per cent interest, will be issued. The Mammoth reservoir will contain 178,000 acre feet and the Mammoth King 50,000 acre feet, in Prowers and Kiowa counties.

W. R. Hotchkiss of Montrose, with several associates, is planning to open 3,500 acres of land in the Paradox Valley, near Nubla. The company expects to build two irrigating ditches, twelve and twenty-four miles in length, to bring water to the land. The undertaking will occupy three years.

Extensive improvements are being made on the Otero Irrigation District canal. The ditch is being widened to thirty-two feet at the top and twenty feet at the bottom, and will have the capacity to carry six feet of water instead of three and one-half feet, as heretofore. The improvements also include thirty miles of dredging, six cut-offs and a tunnel 2,850 feet long at King Arroyo. The work will be completed during the year 1911.

The
Hotel *the nearest to all* **Denver**
places of interest in

THE ALBANY HOTEL

17th and Stout Streets

DENVER

RATES: \$1.00 PER DAY AND UPWARD

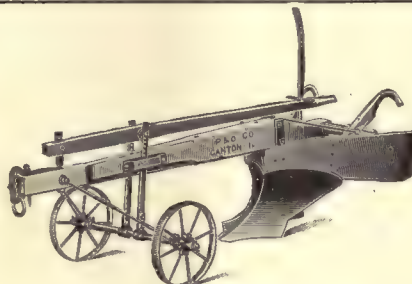


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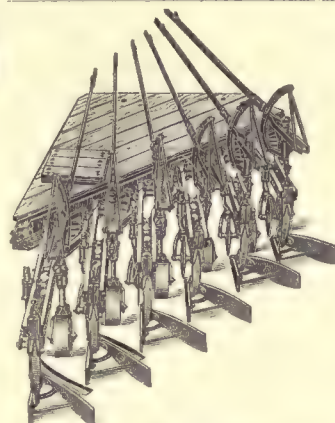
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Books on Irrigation and Drainage

The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
Practical Irrigation, Aug. J. Bowie.....	3.00
Practical Design of Irrigation Works, W. G. Bligh	6.00
Irrigation (as a branch of engineering), Hanbury	
Brown	5.00
Earth Slopes, Retaining Walls and Dams, Chas.	
Prelini	2.00
Road Preservation and Dust Prevention, Wm. P.	
Judson	1.50
Practical Farm Drainage, Chas. G. Elliott.....	1.50
Drainage for Profit and Health, Waring.....	1.00
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Arid Agriculture, B. C. Buffum.....	1.50

The Irrigation Age Company,

112 Dearborn St., Chicago, Ill.

The Chicago, Burlington & Quincy Railroad Company have purchased ten acres of land from John R. Huey of Akron, at \$50 per acre. It is the intention of the railroad company to put in a large reservoir on this tract of land. It is stated that the purpose of this reservoir is to ascertain the length of time required to fill such a reservoir by bringing water from the bottom of the Burlington's deep wells and thus prove or disprove the feasibility of obtaining waters by this method for the purpose of irrigating the uplands of eastern Colorado.

At a meeting held at Rulison recently, for the purpose of organizing an irrigation district, money was raised for making temporary surveys. About 5,000 acres of land are included in the district. The project is contemplated for the purpose of pumping water to an elevation of 180 to 200 feet to start with from the Grand River, and will be hoisted at a point near Webster Hill and be carried by ditch or pipe line down the Battlement Mesa, south of Grand Valley.

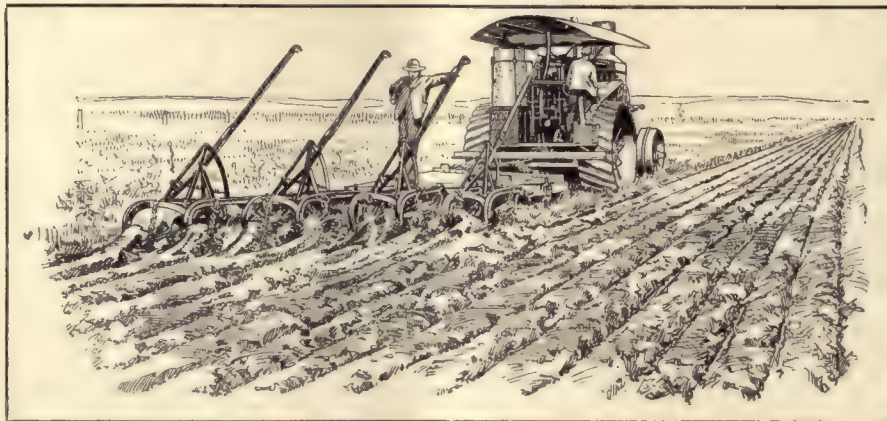
As the result of investigations being made by secret service men, 10,000 acres of rich land on the western slope, and valued at \$3,000,000, may be forfeited to the government and again thrown open to settlement. The land in question is what is known as the Redlands tract, just across the river from Grand Junction. Sometime ago the office denied the claim of contestants which had been filed, but it was supposed that the matter had been settled in favor of the original entrymen, but a notice received from Secretary of the Interior, under date of July 30th, states that the contestants have not established their rights to the land, and at the same time there is a suspicion of illegality in the original entries.

The Secretary of the Interior has affirmed the decision of the General Land Office, rejecting the joint application of F. W. Bosco and Cyrus Miller for right-of-way for the Wagon Wheel Gap reservoir over certain

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lands in Mineral County. The decision appealed from is based wholly on a report of the director of the Reclamation Service, dated October 19, 1909, which states that the approval of this application would constitute a serious interference with the Rio Grande project now under consideration.

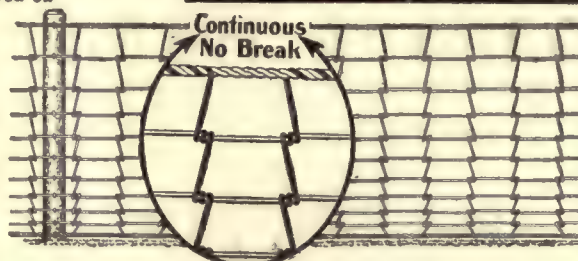
Engineers in the employ of the Western Reclamation Company of Denver have opened a subterranean stream on the property of the East Colorado Springs Land Company, near that city. Enough water has been developed from underground sources, it is claimed, to irrigate 2,000 acres immediately east of Colorado Springs.

The Sam Farmer Escalante Irrigation Company of Delta has filed articles of incorporation, with a capital stock of \$1,000,000, with 100,000 shares of stock at \$10 par value. It is the intention of the company to irrigate 20,000 acres of land, lying to the west and southwest of Delta. The company estimates that it will require \$250,000 to complete the work, and that \$50,000 of the amount will be spent during the balance of this year. The incorporators are Sam Farmer of Delta, Judge W. Beane, Frank B. Thompson, Peter O'Brien, Geo. L. Horton; the last four of Denver, and Mr. Stone of Trinidad.

Farmers living in the vicinity of Eaton are much interested in a new scheme which is being started by the Eaton Electric Light & Power Company, which provides for the lifting of water from wells and spreading it over the ground which cannot otherwise be irrigated. The company has purchased a number of electric motors and has placed them in operation.

The Hereford Reservoir & Irrigation Company have have filed maps and statements with the county clerk at Greeley, for the construction of a reservoir and two ditches. The reservoir will cost \$15,000 and will have a capacity of 110,090,000 cubic feet. The ditches will cost \$12,000. Water will be taken from Crow Creek to water the land, which lies near the Wyoming line.

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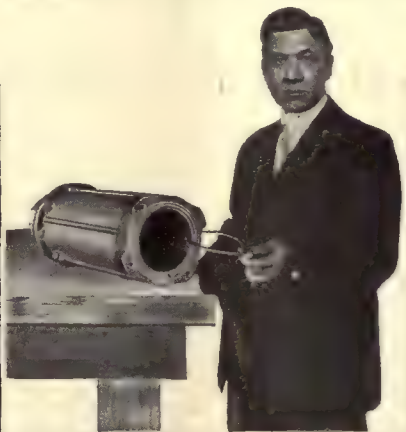
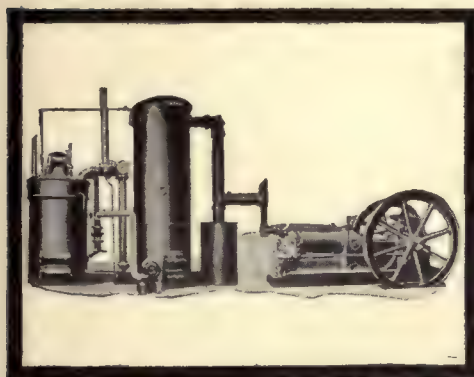
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CHAS. MIX CO. MFG. CO.
Signed, F. C. Smith.

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¶ The real reason Otto Products are cheapest is not that their first cost is less, but that they give so much longer and better service.
¶ The above photograph illustrates just one of the economical features of the Otto Gas Engine. This one feature alone would most likely save you the entire difference between the Otto's first cost and that of cheaper engines. ¶ This advantage is the extra thickness of the walls of Otto cylinders. ¶ Every gas engine cylinder sooner or later requires reboring. ¶ Well, the Otto is sufficiently thick to permit of several reborings should conditions under which it is run make it necessary, which is one reason the Otto is running as good as new long after cheaper engines have found the scrap heap. ¶ The 32 years since the Otto Gas Engine was first produced have conclusively proven it the most economical gas engine and when operated in conjunction with the Otto Suction Gas Producer (illustrated above) completes the most economical prime mover obtainable with the exception of water power. ¶ The Otto Suction Gas Producer, like the other Otto products, has long since proven itself; so conclusively in fact that over 5,000 of these producers are today in successful operation. ¶ We print a letter from one user above; we'll send you many more together with complete catalogs, etc., if you simply sign and mail the attached coupon now before you forget.

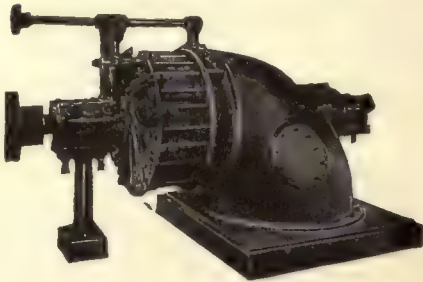
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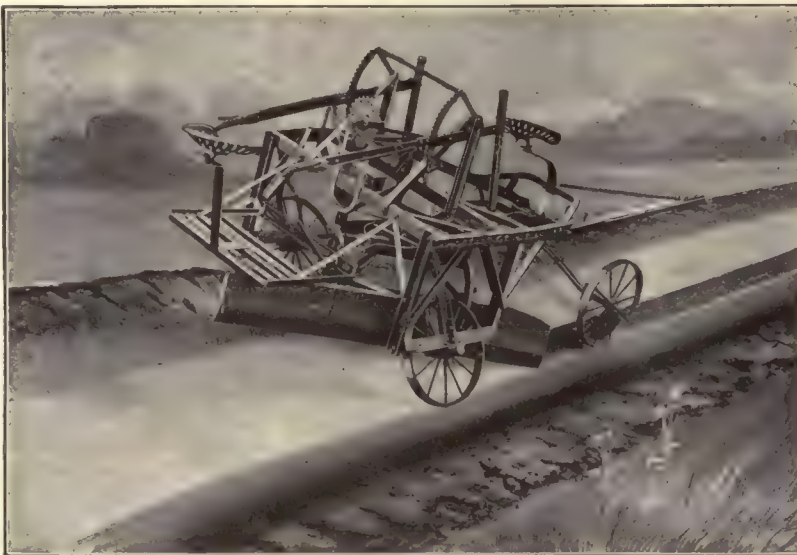
316 Lagonda Street

At a special meeting of the stockholders of the Bent Reservoir Company, held at Las Animas recently, it was voted to issue \$590,000 in first mortgage bonds to complete the construction of the reservoir and ditch. The stockholders have also voted an increase of the capital stock from \$125,000 to \$800,000. The company owns the Rule Creek reservoir site, situated on Rule Creek, about ten miles above its mouth. The drainage area filling this reservoir is the largest in that part of the state on any side stream, and it is expected that it will fill at least twice a year. The proposition is being promoted by farmers who have filed desert claims, although some have homesteads and deeded lands. The land to be covered lies on both sides of Rule Creek, just southeast of Las Animas. Water rights under this system will cost \$40 per acre.

It is reported that W. H. Mitchell and George Pierce of Florence have purchased the Columbia Hessick artesian well, two miles southeast of that city. It is the intention of the purchasers to set out 100 acres of fruit land adjoining the property, build a reservoir to conserve the water. The land will be divided into small tracts of five and ten acre tracts and placed on the market.

R. T. Frazier of Pueblo, together with other capitalists of that city, have formed a company known as the Chicosa Park Irrigation Company, and will place under irrigation 10,000 acres of land just south of the town of Boone. The company will be a co-operative one; the land to be irrigated has been taken up by Puebloans and residents of Boone under the desert land act, and the stock in the irrigation company has all been subscribed for by the landowners. The surveys have been completed and actual construction work will be commenced in the very near future. The source of the water supply is the Huerfano River and a storage irrigation system will be constructed. The promoters expect to put water on the land at less than \$20 per acre.

The Little Roadster Grader and Ditcher



THE LITTLE ROADSTER

A New, Light Ditch Plowing Machine, Especially Designed for Cutting Small Laterals on Irrigated Farms, and Ditching and Grading Roads.

This type of machine cuts ditches for less money than any other tool or machinery, because it plows the dirt out of the ditch with one continuous motion, whereas all other ditching machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling land-sides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

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A large canal for the irrigation of 10,000 acres of land in the Grand Valley, near Grand Valley City, will be commenced in the near future. Water will be taken from the Grand River, and the canal will carry 300 cubic feet of water per second. The canal will be over 20 miles long. It is estimated that the cost of this project is \$500,000. The land under the system will be sold in ten and twenty acre tracts.

At a recent meeting of the board of directors of the Uncompaghe Water Users' Association, held at Montrose, it was decided that the government will supply water from the Gunnison tunnel only to those whose ditches which have signed up for tunnel water, and no land will be supplied under any consideration that has not subscribed. Heretofore it has been the rule that no ditch could be supplied with water from the tunnel until 25 feet had been subscribed, but this rule has been rescinded.

Lewis A. Curtice of Denver has brought suit in the district court against the Colorado Milling & Elevator Company, and John K. Mullen, to recover \$24,333. Curtice claims to have been damaged to this amount by being deprived of the use of water from the Platte River, which runs through the old mill ditch in west Denver. Curtice avers that he owns 73 shares of water, which were secured by him in 1866. He claims that the milling concern has been using his share with the rest for 10 years. It is stated in the complaint that in March, 1900, the milling company built a bulkhead, cutting off his supply altogether. He places a valuation of \$5,000 per year on his share of the water.

Judge Garrigues of Greeley has confirmed the \$5,100,000 bond issue voted by the Greeley-Poudre district. The judge granted an application for an appeal, fixing their bond at \$10,000 and allowing until December 1st to perfect the appeal. The confirmation of the bond issue will clear the way to carry out the projects and work will start at once on the tunnel reservoir at the west end of the Maramie-Poudre tunnel. The contract for the con-

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Cut showing diggers and fenders attached. These can be removed and the blade set for lateral ditching in five minutes.

BLADE COMPLETELY REVERSIBLE
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Especially adapted to **IRRIGATION WORK**. Has Low Feed, Automatic Loader, and is **Easily Portable**. This machine is sweeping the field because it "delivers the goods" with such **remarkable efficiency** and is so much nearer **indestructibility** than any other mixer ever made. Study the "spotlight." See the

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struction of this reservoir has been let. It will have a capacity of 170,000,000 cubic feet per second and will cost \$140,000. The district includes 125,000 acres in the northern part of Weld County.

The Florida-Mesa irrigation district, embracing about 25,000 acres of land in Durango County, has voted a bond issue of \$1,000,000 for construction work, and \$60,000 for the first year's interest, dating from August 1, 1911, the contracting company taking care of the fractional part of the year. The contract for construction of reservoirs and ditches has been let to the Pioneer Construction Company and work will be commenced by September 1st of this year.

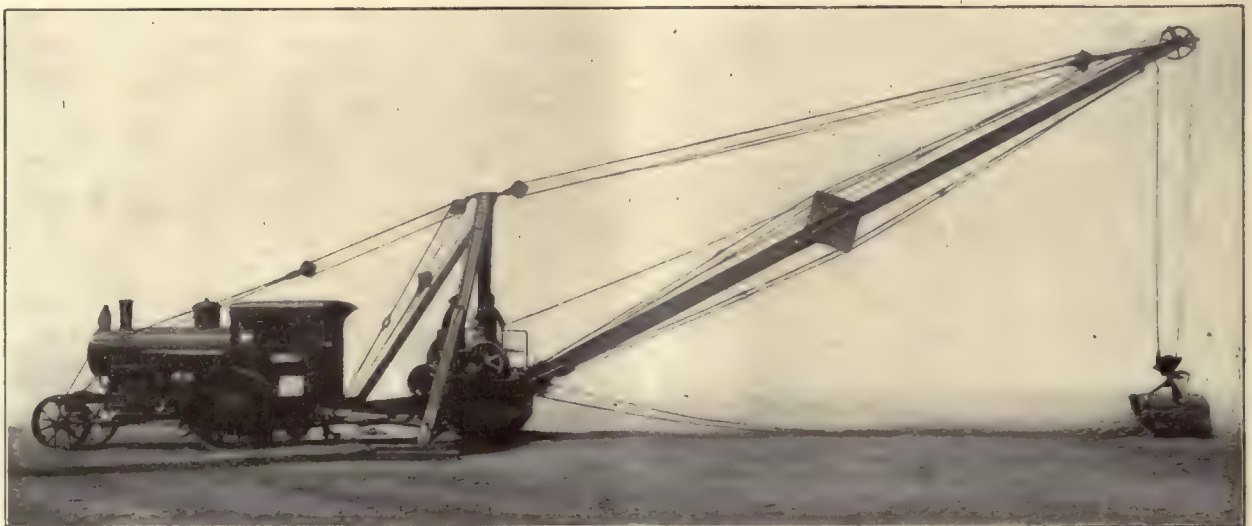
The Pueblo-Rocky Ford Land Company has been organized to sell the 30,000 acres of land under the ditches of the Pueblo-Rocky Ford Irrigation Company. The main office of the Pueblo-Rocky Ford Company will be situated at Topeka, Kan., with a branch office in Pueblo. It is the intention of the company to sell the land in 40, 60 and 80 acre tracts. The land lies south of Pueblo and extends nearly to Rocky Ford. It is to be sold with the guarantee of water being turned on by the irrigation company in the spring of 1911. The capital stock of the company is \$100,000 divided into 1,000 shares of \$100 each. The incorporators are P. J. Dugan, W. J. Lester and J. E. Shoemaker. Contract for the construction of the outlet tunnel and canal has been let to the McDowell Construction Company of Rocky Ford.

IDAHO.

At the last meeting of the State Land Board the application of the West End Twin Falls Irrigation Company for an extension of time in which to get water upon their lands was heard and taken under advisement. The company made the argument that it would be unable to complete construction work by the time originally specified, viz.: June 1, 1911, and requested an extension until June 1, 1912. The board took the matter under advisement.

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It has three very great advantages: **First**—it requires no track to run on; **second**—moves from one job to another can be made quickly and without the heavy expense of having to tear the entire outfit to pieces; and **third**—in buying this outfit you not only get a splendid Steam Shovel Outfit but a complete Traction Engine as well, which you can use for all kinds of Traction and Belt Work.

Designed for digging drainage and irrigation ditches, for use in gravel pits, stripping coal, and for other similar purposes.

A number of these outfits have already been sold. Every one is in successful operation. Ask for complete circular fully describing this machine and showing it in operation.

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When writing to advertisers please mention The Irrigation Age.

The State Land Board has approved the plans for the biggest reservoir yet undertaken in Idaho. This reservoir will be the property of the Twin Falls North Side Land & Water Company, and will be situated about six miles northeast of Jerome. It will have a capacity of 150,000 acre feet of water and will cost approximately \$500,000. It will cover 8,000 acres to an average depth of twenty feet and will water lands in the vicinity of Jerome, Wendell, Gooding, Bliss and Ticeska. Contracts have been let for the construction work and the dam is to be completed by December 1st.

Discovery has been made through repair work recently executed on the Deep Creek Land & Water Company's dam near Twin Falls, that an underflow exists in that channel which seems sufficient for enormous irrigation supply without having recourse to the flow above ground. Last spring during the period when the snow banks melted off the foothills, Deep Creek ran riot and the upper dam of the Deep Creek Land & Water Company was partially washed out. Repairs necessitated by this overflow have been in progress for sometime. A short time ago when the workmen were excavating in order to find bedrock, about five feet below the stream's bottom they encountered a strong underflow. It is now expected that promoters will sink wells on the large arid areas in the foothills south, southeast and southwest of Twin Falls, known as the Three Creek region, with a view of discovering whether or not there is sufficient underflow to irrigate the land.

Homesteaders residing on the second and third benches south of Boise are interested in the striking of a large flow of water in wells sunk on the farm of B. S. Miller near that city. Mr. Miller sunk four test pits and struck water at a depth of five feet. He states that he will sink wells to a depth of ten feet, cement the walls, pump the water to the surface and distribute it over his 160 acres.



New American Turbines

will improve your water power because they are EFFICIENT, POWERFUL and DURABLE.

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HEAD GATES and HOISTS

is the most complete on the market, and we have patterns for all sizes and types. Don't forget that a reliable Head Gate is one of the important parts of any power plant.

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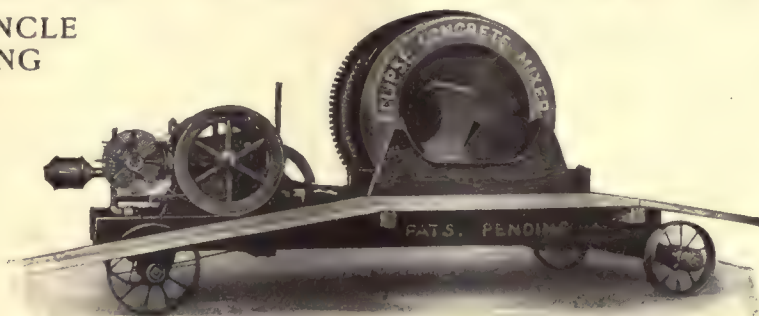


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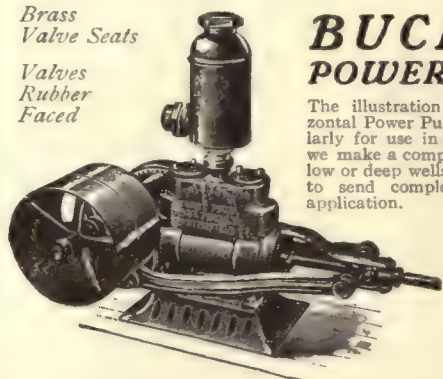
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For Sale

On reasonable terms, a bearing peach orchard in the famous Grand Valley of Colorado. Within two miles of Palisade, where failure is unknown. This tract contains 17 acres and is all set to peaches—best varieties—80 percent Elberta, balance Carmen and Salway.

Good house, barn, chicken houses and cistern. All new. For further information address

E. W. GODRON

PALISADE - - - - - COLO.

L. R. Erskine & Son of Artesian City are installing an irrigation outfit on their ranch on Dry Creek. They expect to raise the water from wells into a ditch and carry it on to the flat to their orchard.

It is reported that the Snake River Irrigation Company of Boise has been financed and that the contract for the dam has been let. This work involves the expenditure of \$500,000. The contract calls for the completion of the work within five months from commencement of construction. The dam will be of the gravity type and will be of reinforced concrete. The dam will be 22 feet high, raising the water 14 feet above low water. The spillway will be 450 feet long, and the base, up and down stream, 53 feet. This property is known as the Castle Butte project.

The Secretary of the Interior has prepared a set of rules to govern the pumping of water by settlers on the Minidoka irrigation project, Idaho, from the Government canals to the high areas.

These rules will not permit the installation of current wheels in Government ditches. They provide for the delivery of water for high land areas into pumps adjacent to the canals. Their purpose is to protect the works from injury and to facilitate the measurement of water in its distribution.

The charges for water shall be the same as for gravity lands.

MONTANA.

J. W. Johnson of Hardin is authority for the statement that a new irrigation project, embracing 15,000 acres of bench land west of that town, is to be launched by the Two Leggin Canal Company. Water will be taken from the big ditch belonging to this company, which already irrigates 20,000 acres. The canal will be supplied with water by a pumping plant and as the supply comes from the Two Leggin Canal the latter

Ambursen Hydraulic Construction Co. ENGINEER-CONSTRUCTORS

176 Federal St., BOSTON, MASS.

Our business is the investigation, engineering, construction, and operation of Hydro-Electric Power Developments and Irrigation Reclamation, including Secondary Irrigation by pumping, a feature which under right conditions and properly engineered will double or treble the available area under the ditches.

We specialize on high dams and dams on difficult foundations. Our experience is based on the construction of 56 dams to date.

At the present writing, May 21st, we have under construction eight dams as follows:

A dam 45 ft. high and 700 ft. long in Newfoundland; a dam 48 ft. high and 900 ft. long in Georgia; a dam 48 ft. high and 470 ft. long in Wisconsin; two dams respectively 54 ft. high and 450 ft. long, and 60 ft. high and 550 ft. long in Minnesota; a dam 86 ft. high and 680 ft. long in Oregon and three smaller dams in Maryland, Indiana and Kentucky respectively. Seven of these dams include a power house in the bulkhead of the dam. The time of construction on each will be about eight months with the exception of the Oregon dam which will require about a year.

will be considerably enlarged. An immense turbine will be installed which will hoist the water to the bench, where it will be stored in a large reservoir to be distributed to the land as it is needed.

The Conrad Land & Water Company of Valier, having liabilities of over \$2,000,000 and assets of about \$4,000,000, is in the hand of two receivers, James T. Sanford and W. C. Winton, appointed on complaint of Kennefer & Russel of Denver, who have a large contract for ditch work. The company is engaged in the irrigation of a large tract of land near Great Falls, and the two receivers will continue the work.

National Government engineers have reported against the Teton irrigation project, which it had planned to promote under the Carey Act, with the approval of the state officials. The State Board had taken action to set aside under the Carey Act about 24,000 acres of land along the Teton River for the project.

Governor Norris of Helena received a letter from the Secretary of the Interior, stating that if a portion of the Dearborn irrigation project lands in Lewis and Clark counties are not reconveyed by deed to the government by August 15th that action will be instituted for their recovery. A patent was issued for the land, but the government claims that it was not reclaimed properly under the provisions of the Carey Act. The State entered into an agreement with the Ames Realty Company of St. Louis, Mo., to reclaim the land and, after constructing reservoirs and ditches, patent was issued to the State. Floods washed out the improvements and the Washington officials asked that the land be reconveyed to the government. The State agreed to sign the deed as did the Ames Realty Company, but the latter instead sold its rights to the Great Falls Land & Irrigation Company of Chicago.

Invest in Irrigated Land

The greatest opportunity ever offered to purchase an irrigated farm at a reasonable price is now given **YOU** by the opening of 16,000 acres of the richest and best land in the Pecos Valley, Texas.

You can now buy land that will double in value in two years, or if you wish to farm the land purchased it will net you 50% after the first year if sowed in alfalfa and larger returns if planted with fruit after trees begin to bear. Alfalfa can be cut five to seven times per season and will average from one to two tons per cutting. Alfalfa is now selling at \$16.00 per ton. Secretary Coburn, of the Kansas State Board of Agriculture, says that this great valley will be the "pear orchard of the world." What is true of pears is also true of apples, peaches, apricots and grapes.

A few of the reasons why an investment in this land must produce large results

First: It is one of the richest and best bodies of land ever opened to settlement.

Second: The Santa Fe Railroad runs eleven miles through these lands and no forty-acre tract is more than two miles from the railroad or three miles from a railroad station.

Third: The market is one of the best in the world. Its climate is healthful and delightful.

Fourth: The irrigation system has been completed at a cost of over \$300,000.00 and these lands are irrigated NOW and water in the ditches, and **YOU** get a perpetual water-right with your deed and become part owner of this great irrigation system.

These lands are now selling at the opening prices, which prices will be raised from 25% to 33 $\frac{1}{3}$ % within the next sixty days. **THIS MEANS MONEY TO YOU IF YOU BUY NOW.**

Investigate at once and write today for further information.

ARNO IRRIGATED LAND CO.

Room 1210, 134 Monroe St.

Chicago, Ill.

THE GOULD COMPANY

Ohio and Franklin Sts., Chicago, Ill.

Factories, Chicago, Ill.

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DOUBLE POWER

\$1,000 Reward
for its equal. Wind power doubled. Two 14 ft. wheels work on same pinion; second wheel gives more power than first.

A Governor That Governs
in all winds. Develops 10 full h. p. in 20 mile wind. All power needed for farm, shop, irrigating, etc. Ask about our self-oiling, self-governed, single wheel pump—also Armsaver Husker. Ask for book 61!

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Gas—Gasoline—Distillate

cheapest and best power known. Average cost one cent per horse power per hour. A superior standard of construction saves time, fuel and repairs. We refer you to thousands of satisfied customers. High grade engines our specialty for 25 years.

Five Year Guarantee

This engine is built for those who want the best. We furnish any size or style; hopper jacket or water tank type. We ship promptly. Everything is complete. Our prices are right. Inducements to introduce in new localities. Write for catalog, stating size wanted.

WITTE IRON WORKS CO.
1605 Oakland Ave., Kansas City, Mo.

(Continued from Page 508)

quickest and most efficient manner. Many western irrigators use too much water and too little cultivation. Many injure their crops and soils by allowing the water to run too long on one place, drowning the plants and alkalizing the soil. A quick application of water which thoroughly soaks the land and then removing it, to give the soil opportunity to become aerated again, is best.

In the arid regions systems of irrigation and cultivation which induce plants to send their roots deep into the soil are important. Deeply rooted plants are not so subject to drouth and find a comparatively large soil pasture from which to gather moisture and plant food. Deep and continuous cultivation from the time the plant is started until the crop has become thoroughly established, will do much to secure deep rooting. This is important in orchards and tree plantations. The cultivation must be continuous, however, for if left for a long enough season of growth most of the plant roots will be thrown into the surface soil, after which cultivation would so severely prune the roots as to set back the growth and injure the plants. Light or superficial irrigation which simply puts enough moisture into the soil to wet the surface induces plants to throw out surface roots instead of those which should go deeper into the sub-soil. It also starts evaporation from the surface which causes loss of water. Deep and thorough irrigation causes deep rooting.

32 YEARS OF SUCCESS

SUCCESS SPREADER

ROLLER-BEARING
LIGHT DRAFT

SUCCESS SPREADER

The only spreader with a 32-year record of good work. Simplicity, Durability and Light Draft always foremost. Direct Chain Drive. No Cog Gears. The choice of men who investigate thoroughly. Wood or metal wheels. A generation of experience back of every Success. The leader from the first. Exclusive features all patented. Catalog of facts Free. Write us promptly.

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Successful Irrigation Depends Upon "THE TILE THAT LASTS"



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We are the leading manufacturers of tile molds, collapsible culvert forms, mixers and other concrete machinery

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CHICAGO

CANTON DITCHING PLOW DOES IT.

IN these times of farm progress, no more are drainage ditches dug by hand at slow and painful length. Modern machinery has made ditch digging easy and cheap. One of the latest inventions of this kind is the Canton Ditching Plow, the only plow of the kind manufactured. It cuts a 20-inch furrow, throws the dirt three feet each way, when used with extension wings, and leaves a clean, smooth ditch. The plow is constructed of heavy oak, well seasoned, the beam being reinforced and strengthened by a heavy steel strap running along its underside and attached to the standard in the rear. It is really a double plow of two ordinary bar shares and molds, one right and one left hand, securely bolted, both bars extending back in the center of the furrow, thus making an effective gauge shoe. The plows are handled and the depth of the furrow regulated by adjustable truck or fore carriage. This can be set for any depth, both for first and second plowing and the wheels are set apart to ride the bank when plowing the second time. By means of wings which have a lateral adjustment and an extreme sweep of six feet; when plowing the first time the dirt is thrown away from the bank, leaving a clean surface for the truck wheel to ride. The plain plow weighs 340 pounds and the wings add 50 pounds more. It is so strongly built that it may be safely used with six or eight horses. It is manufactured by the Parlin & Orendorff Company, of Canton, Ill., who will be pleased to supply any additional information desired.



Running Water

in any quantity for the orchard or garden with

RIFE RAMS

pump water automatically day or night

The first cost is low; there's no operating expense. Raises water 30 feet for every foot of fall. **Fully guaranteed.**

If there is a stream, spring or pond within a mile, write for **Free Plans, Free Book and Free Trial Offer.**

RIFE ENGINE CO.

2511 Trinity Bldg.
NEW YORK



Wagons Of Lifetime Service Bear The I H C Trade Mark

There is no need of taking a chance on your next wagon. You will be sure to get a good wagon if it bears the I H C trade mark.

It is the seal of excellence—the guarantee of quality—it stands for an established reputation—and utmost wagon value. It is your assurance of getting a good wagon—one that will be a source of pride and profit—one that will give you excellent service for years to come. Choose any one of these—

Weber New Bettendorf

Columbus Steel King

Look these wagons over carefully. They are built to meet every condition—to fill every requirement—and whether you buy a Weber, Columbus, New Bettendorf, or Steel King, you will get the same satisfactory service.

Only the toughest, most carefully selected, air dried and perfectly seasoned wood is used in the Weber construction. Weber wagon boxes and gears are protected by paint and varnish of the best quality, applied by workmen who have made wagon painting a life-long study. For 65 years the Weber wagon has been king of the wagon world.

Columbus wagons are favorites with exacting farmers. The gears are made of selected oak and hickory, strongly ironed. The wheels have oak rims and oak and hickory spokes. The wheel is properly tired and banded. Superior workmanship and high-class material, assures the durability and light-running qualities which characterize every Columbus wagon.

The New Bettendorf has given general satisfaction because it has exceptional strength, light-running qualities, and is very durable. It has a one-piece tubular steel axle, and the wheels are the same quality as those used on the Weber.

The Steel King is a new I H C wagon and it is up to the I H C standard. It is the only steel gear wagon on the market having an axle and skein with internal reinforcements and a bolster having an adjustable stake.

Visit the International local dealer and let him point out the many features and advantages of wagons bearing the I H C trade mark. Get booklets and all information from him, or if you prefer, write nearest branch house for the information you desire.

**WESTERN
BRANCH HOUSES:**
Denver, Col.; Helena,
Mont.; Portland, Ore.;
Spokane, Wash.; Salt Lake
City, Utah; San Francisco, Cal.

International Harvester Company
of America Chicago U S A
[Incorporated]



THE I-H-C LINE

LOOK FOR THE I. H. C. TRADE MARK. IT IS A SEAL OF EXCELLENCE AND A GUARANTEE OF QUALITY

Send \$2.50 for The Irrigation Age one
year and The Primer of Irrigation

A NEW IRRIGATION DEVICE.

We are presenting herewith illustrations of a new patent weed cutter, known as the Ziemsens's Weed Cutting Saw, which is an extremely simple device for clearing irrigation ditches and reservoirs, as well as rivers, fish and ice ponds, lakes, bathing places, or for clearing



A.—Before Weed Cutting Saw Was Used.

ing muddy streams by cutting away the roots which retain the mud.

The photograph marked "A" shows a pond before the patent weed cutter had been used, and the one marked "B" shows the same pond after it had been gone over with this saw. This pond is about 33 yards in breadth and was cleared by two men, one on each side of the stream, in ten minutes.

The saw, which can be sent by mail or express, is easily put together by an inexperienced man.

This implement has become an impor-



B.—After Weed Cutting Saw Was Used.

tant article in Germany, England, Austria, the Netherlands, etc., in a very short space of time. It is said to be the first and only useful article gotten out for this purpose and has the advantage over scythe-working in being a very considerable saving of time and wages, which may easily be demonstrated by one trial.

NEW ROAD FOR SUN RIVER

THE immediate construction of the new branch of the Great Northern Railway up Sun River Valley, Montana, now seems assured. The contractor's outfit has already been unloaded at Vaughn, and indications point to the early beginning of work. The assurance of transportation facilities for the Sun River irrigation project has renewed the interest of landseekers and the remaining farms on the Fort Shaw unit are being taken up rapidly.

The Sun River project occupies an area equal to that of Rhode Island. It contains some of the finest land in Montana and when fully developed will furnish homes for 50,000 people. Its canals will have a total length of 3,000 miles and the irrigation system will be one of the largest in the United States. The settlers express general satisfaction with the country, its climate, soil, and its future outlook. The settlers practically all are making good. There are storekeepers, newspaper are not all old farmers. Almost every walk in life is represented and men, blacksmiths, professional men, etc. The women's club is doing good work and centralized graded schools are planned.



IHC

GASOLINE ENGINES

INDISPENSABLE IN MODERN IRRIGATION.

Irrigation—putting water where it will do most good, when it will do most good—is the great new power in modern agriculture. It is turning the desert into high priced farms—it is doubling the productiveness and value of long-cultivated land.

I H C Gasoline Engines

are indispensable in all kinds of irrigation work.

An I H C engine will pump water where you want it, when you want it—dependably—cheaply.

Wells are being used more and more in irrigating. A couple of wells and an I H C gasoline engine will frequently save miles of costly ditch construction and maintenance.

Marshy lands or low-lying ponds or creeks often offer ample water for irrigating. All that is needed is a practical gasoline engine to pump the water where it can be used.



Gravity irrigation with its open ditches is costly—seldom places water where you want it—wastes 50 per cent and is expensive to maintain. An I H C gasoline engine pumps your water direct to where you want it, without loss.

An I H C engine is useful not only for pumping, but it will solve the "hired man" problem and double the value of every machine on the place requiring power. It will operate your grinder, fanning mill, cream separator, churn, thresher, bean huller, alfalfa cutter, etc.

I H C gasoline engines are made in all sizes from 1 to 35-horse power, in styles to fit every requirement. Vertical, horizontal, stationary and portable, and tractors in various sizes—we have just the engine you need. Call and see them at the I H C local dealer's—he will give you full details and catalogue. Or, write the International Harvester Company of America at nearest branch house.

WESTERN BRANCH HOUSES:
Denver, Colo.; Portland, Ore.; Salt Lake City, Utah;
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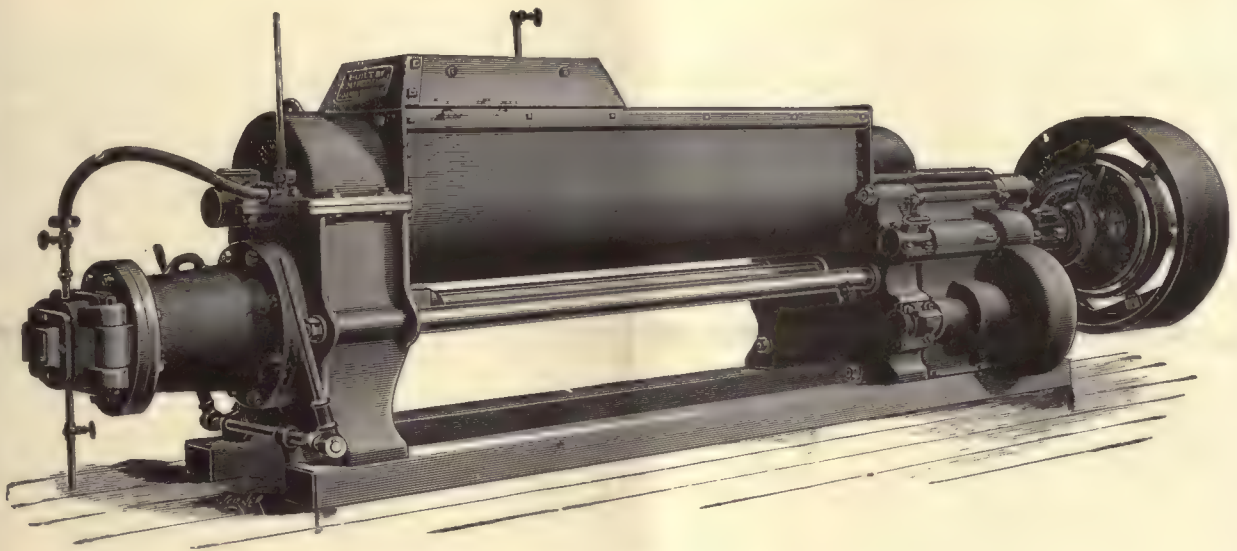



THE I-H-C LINE

LOOK FOR THE I. H. C. TRADE MARK. IT IS A SEAL OF EXCELLENCE AND A GUARANTEE OF QUALITY.

When writing to advertisers please mention The Irrigation Age.

UNION MACHINES WITH PUG MILLS COMBINED



FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
and Paving Brick and other Clay Products

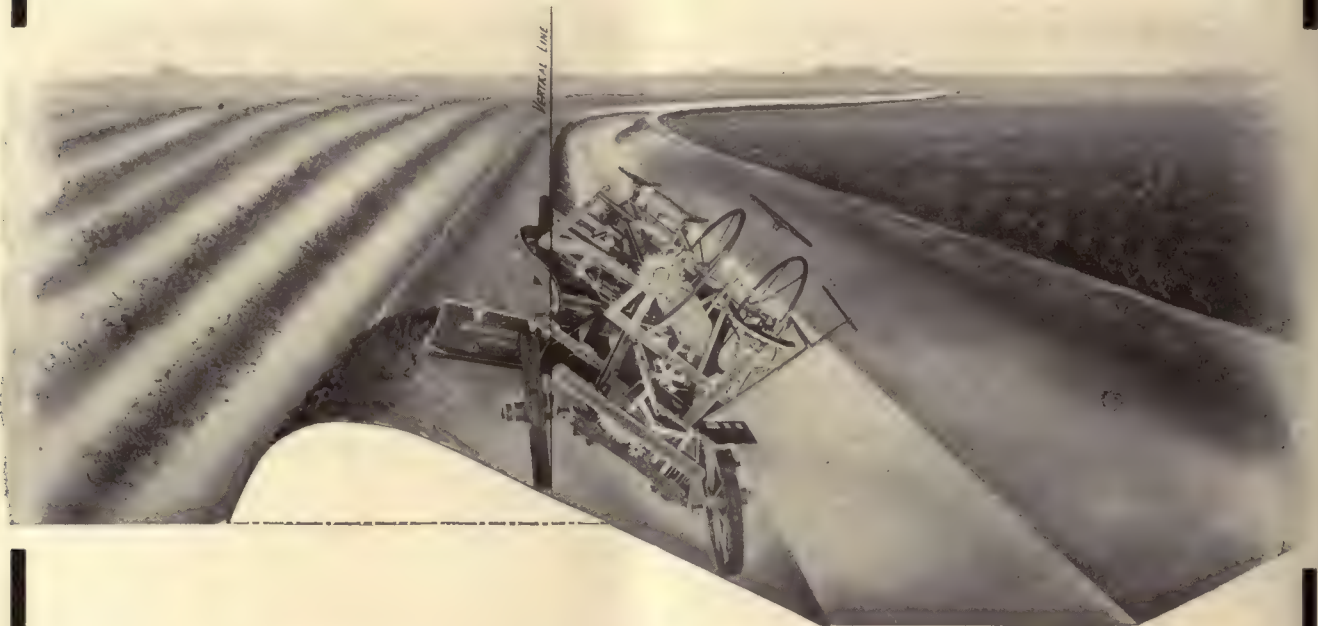
If interested write us for particulars and estimates.

E. M. FREESE & CO.
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THE RECLAMATION DITCHER

For Cutting Irrigation and Drainage
Ditches at the Least Cost



U. S. RECLAMATION DITCHER

This type of machine is different from all other ditching machinery, in that it plows the dirt out of the ditch with a continuous sweeping motion, whereas all other machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The cost therefore, per cubic yard, of excavating with the U. S. Reclamation Ditcher is necessarily much less than with any other tools or appliances.

The Reclamation Ditcher is adapted to cutting ditches as deep as three feet below the original surface and as wide as ten feet at the bottom and with sides sloped as steep as 2 to 1.

It has adjustable oblique wheels which perform the same function as the oblique wheels of a sulky plow. They are simply rolling landsides which counteract the side pressure of the earth on the mold and also make it possible for the machine to be operated on the sloping side of the ditch as shown in the cut.

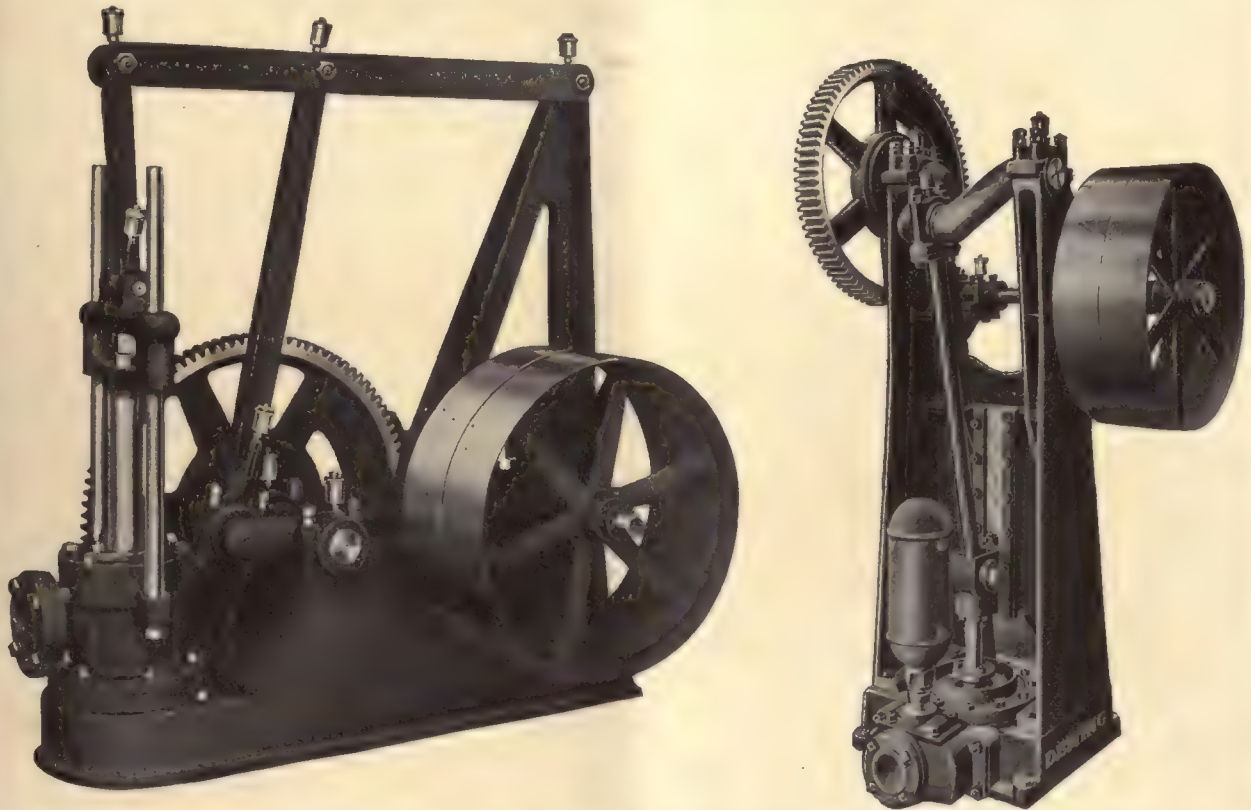
It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

The difference in cost of cutting ditches with the Reclamation Ditcher and any other form of machinery is sufficient to pay for the machine very quickly. We absolutely guarantee this and will prove it to you by a demonstration of the machine on your own work before you accept it.

Write for descriptive folder which gives diagrams of ditches and cost estimates.

J. D. ADAMS & CO., Indianapolis, Indiana

Deep Well Working Heads



These Working Heads Can be Operated by Electric Motor, Gas or Gasoline Engine, Steam Engine or Belt Driven—the Motors and Engines being Direct Connected if Desired.

The chief advantage to the possessor of a Deming Deep Well Working Head is in the immense saving of power money in direct proportion to the great depths from which the water can be pumped.

Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

THE DEMING COMPANY, SALEM, OHIO

HAND AND POWER PUMPS FOR ALL USES

Including Spray Pumps, Nozzles and Accessories

HENION AND HUBBELL, Chicago, Ill., General Western Agents

Other Agencies in All Principal Cities

LOW
One-Way Colonist Fares

To Many Points in
California, Idaho, Oregon
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Electric Block Signals—Dustless,
Perfect Track—Excellent Dining
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THE IRRIGATION AGE

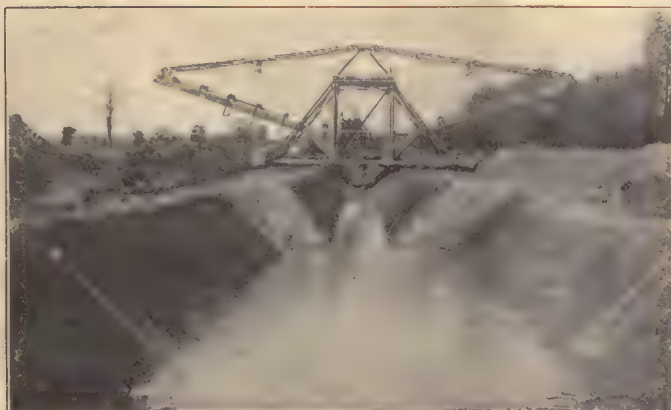
VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

No 11

CHICAGO, SEPTEMBER, 1910

THE CHEAPEST DITCH



Ditch Being Dug with Sloping Banks—An Austin Drainage Excavator Ditch, showing variations in width made by same machine

is not the one whose first cost is least, but the one whose first cost plus cost of maintenance for a period of years is the least.

No machine can dig such a ditch except one that carves a channel with sloping sides, smooth bottom, and wide berms, from the solid soil, in one operation. The

AUSTIN DRAINAGE EXCAVATOR

is such a machine, and it is the only one.

OUR FULL LINE COMPRISES

The Austin Levee Builder
The Austin Side Hill Ditcher
The Austin Tile Ditcher

The Austin Highway Ditcher
The Austin Drainage Excavator
The Austin Orange Peel Ditcher

The Austin Drag Line Excavator
The Austin Rolling Platform Traction
The Austin Stump Puller and Grubber

We Sell Outright or Lease.

Send for Catalogue "S"

F. C. AUSTIN DRAINAGE EXCAVATOR CO.

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Morris Machine Works Baldwinsville, N. Y.

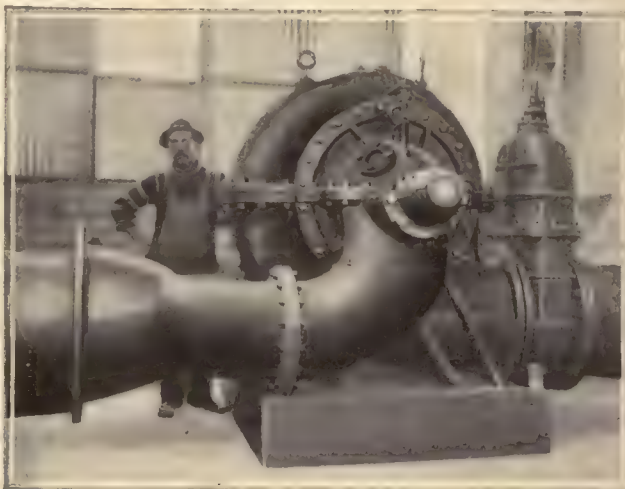
Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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THE IRRIGATION AGE COMPANY, Publishers

CHICAGO, ILLINOIS



Why "American" Centrifugal Pumps Were Selected for the Patterson Ranch—The Model Irrigation Pumping System of America

Read the description of the Patterson Ranch irrigation installation in the July, 1910, issue of *The Irrigation Age* and note that it is conceded the model and most modern irrigation pumping system in the west.

But the important point is that after a careful comparison of the relative merits of all other makes of pumps "American" Centrifugals were selected for this entire project.

On the Patterson Ranch water is pumped to irrigate 14,000 acres and supply the town of Patterson. There are five pumping stations, two of which and two interior views, showing "American" Centrifugals, are illustrated herewith.

Guaranteed efficiency under the low head conditions, combined with simplicity and low expense of up-keep, won the order for The American Well Works.

After the order was given the Patterson Ranch Co. sent Mr. Arthur L. Adams, M. Am. Soc. C. E., Consulting Hydraulic Engineer, San Francisco, Calif., to Aurora to make a thorough test of these pumps in The American Well Works' Testing Laboratory. The Laboratory is a concrete building erected exclusively for this purpose and tests were made under actual working conditions.

The result of these tests gave the "American" 15-inch Centrifugal an efficiency of 77.4% when pumping against a total head of only 22.69 feet. Remember it is much more difficult to attain high mechanical efficiencies on low heads than higher ones.

At the conclusion of his report Mr. Adams said:

"The writer confesses to have had in the past some doubts as to the practicability of securing from centrifugal pumps as high efficiency, under comparatively low heads, as these pumps have shown, and he is correspondingly gratified with the result."

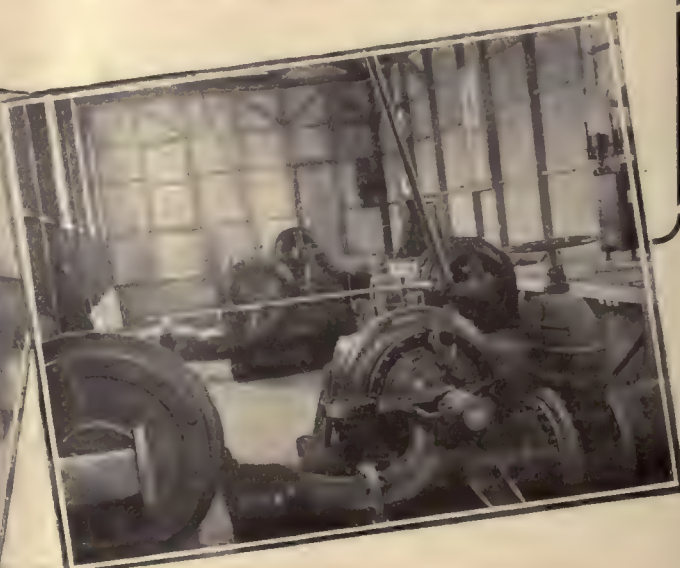
Mr. Adams' complete report mailed free on request.

New 8x11 inch, 116 page Centrifugal Pump Catalog, No. 117, the most complete ever issued, just off the press. Your copy is waiting you. Write for it today.

Let us prove to you that the pump that is best for the most perfect irrigation pumping plant in America is best for you.

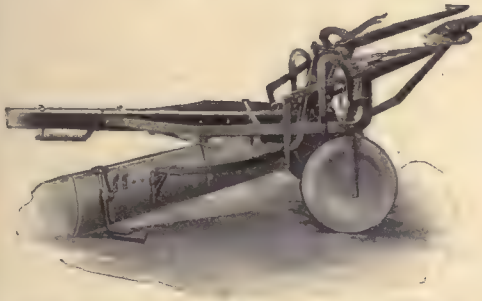
The AMERICAN WELL WORKS
General Office and Works: - AURORA, ILL., U. S. A.

Chicago Office: First National Bank Building.



The Master Of Irrigation

This Wonderful Little Steel Grader Will Solve Every One of Your Irrigation Problems—Cut Your Work In Half—Bigger Profits Easily Made



Notice Grader has only two wheels. Both behind blade. Flanged wheels prevent side draft.

THIS 600-pound 20th Century Grader—with *one man* and *two or four horses*—will do the same work with less effort in half the time required by the big 2,000-pound graders with two men and four or six horses.

Not only that, but it is the most all-around, serviceable machine you can have on your place. You can put the 20th Century Grader to a score of uses—saving time, money and labor at every turn.

It saves you the cost of several expensive machines that you have to have although you use but once a year.

20th Century Grader

The 20th Century Grader is the Irrigator's best friend. Just read what you can do with it.

Cut Laterals for Irrigation.
Make Shallow Drainage Ditches.
Cut Side Ditches.
Level Fields for Irrigation.
Throw up Dikes for Rice Farming.
Slash off Sage-Brush.
Grade and Crown Roads.
Spread Gravel and Broken Stone.
Clean Laterals and Throw Borders.
Maintain Gravel and Dirt Roads. Move Dirt anywhere and drop it where you want it.

The 20th Century Grader is the original one-man machine. It is built of steel and weighs but 600 pounds. It turns in a 10-foot circle.



Cutting ditch 20 inches deep—24 inches wide.

Besides light draft the 20th Century is built right. Every part made to stand its proportionate strain. The pull of the team concentrates at the point of the blade. *Every ounce of power goes against dirt.*

Make your year's work count. Get bigger returns with lighter work by using modern steel machinery.

Let us send you descriptions and actual photographs of these machines at work. Let us tell you what other people say who use them.

Send a post card today and detailed information will come to you at once.

The Baker Manufacturing Company

726 Fisher Building, Chicago, Illinois

The Baker Mfg. Company

726 Fisher Bldg., Chicago, Ill.

Please send me your illustrated catalogue.

Name.....

Address.....

"Your Money Back" Guards You

THE cheap little car, fresh from the factory, looks spick and span, and seems to promise its buyer a great quantity of enjoyment, but—When that buyer gets his *next* car, he *does not* get one of those cheap little cars.

Why?

Not because he likes to spend more money.

But because he wants to *save* money.

• • •

Think that over.

It means something.

• • •

If a new car costs \$1500, and one year's repairs cost \$500, the price of that car is really \$2000.

If this \$2000 car is in the repair shop, getting fixed up, three days a month, its owner is losing one-tenth of its service, or \$200.

This car, therefore, stands its owner \$2200 the first year, although it cost only \$1500 to begin with.

• • •

In using this cheap little car its owner never knows when something is going to break and leave him stranded miles from home.

Being a cheap car, it can't climb hills like a good car, it lacks the speed of a good car, it hasn't the size, style and beauty of a good car, and wherever the owner goes with it, it advertises him as a *cheap* buyer.

That's why no man ever buys one of these cheap little cars a second time.

• • •

If a car isn't worth buying a second time, it *isn't worth buying at first.*

And the buyer who recognizes that fact before he buys any car at all, saves himself much expense, much disappointment, and much annoyance.

• • •

If you are planning to buy a motor car, read every word of this advertisement.

• • •

We have made motor cars continuously since 1896. Mr. Winton made and sold the first gasoline car produced in America. He has made and sold more first-class cars than any other single manufacturer. And we have on our books the names of men who have bought as many as six or eight of our cars. One buyer, Mr. L. R. Speare, president of the American Automobile Association, has owned and used 16 different cars of our manufacture.

It is because Winton cars are right in the first place—right in material, workmanship, power, style, beauty and cost—that once a man buys a Winton he will never be satisfied with any other make.

• • •

One reason why this is true is that the Winton car stands up under hard use with a smaller repair expense than any other car on the market.

Sworn testimony of 20 Winton owners (we send you their names and addresses upon application) show that 20 Winton cars travel 184,190 miles on \$142.43 repair expense.

That distance is more than seven times the distance around earth at the equator.

And each car's average repair expense for 1000 miles is 77 cents.

That's a world's record that touches the pocket book of every automobile owner.

Compare that record with the expenses of the owners of other cars—right in your own neighborhood.

• • •

This wonderfully low expense record of Winton cars shows that they are right in the first place—right in material, workmanship, power, quality, performance, right in everything that makes an automobile worth while.

• • •

Because they are right in the first place, Winton cars stand longer than any other car on the market.

There are any number of Winton cars made as far back as 1896 still doing daily service in this country.

No other maker has a record to compare with the Winton record.

• • •

And because Winton cars stand up indefinitely, and run at low expense than other cars, it follows that a Winton car is always a good purchase, no matter how old it may be.

For the quality is in the car itself, and it stays there.

If the quality isn't in the car in the first place, you can't put it there.

And that's why the buyer of a cheap little car never buys one the same make a second time.

Because it depreciates so quickly that what little merit it originally possessed is soon gone, and the car is worthless.

• • •

We realize that there are many buyers who hesitate to put into their first car as much money as we get for our 1910 model—\$3000.

But we want the trade of these buyers just the same, because we know that once they become acquainted with Winton merit they will be the best salesmen for Winton cars we could get.

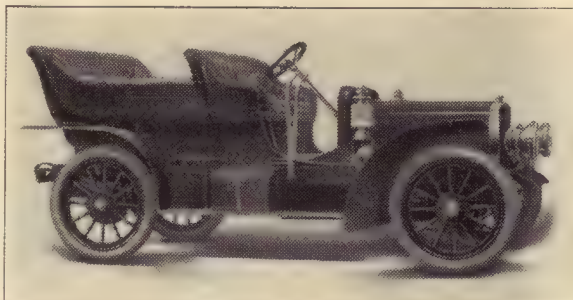
So we have devised a plan where the man who doesn't want to spend \$3000 can still get a Winton car, and be in the class of high-grade buyers and satisfied owners.

• • •

This is the plan.

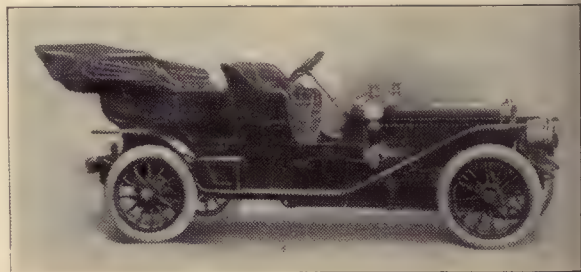
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And note this: You are not obligated in any way. We never ship a car to a prospect and try to force him to take it, when he has only asked for information.

The Winton Motor Car. Company doesn't do business that way.

If after we have told you exactly what we have, you decide to look the car over, we will arrange for a demonstration before you put down a cent. Even then there is no obligation on your part. You needn't buy at all unless you are ready to buy and unless you are satisfied. And even if you do buy, remember we say: **"Your money back if the Winton car is not as we have represented it."**

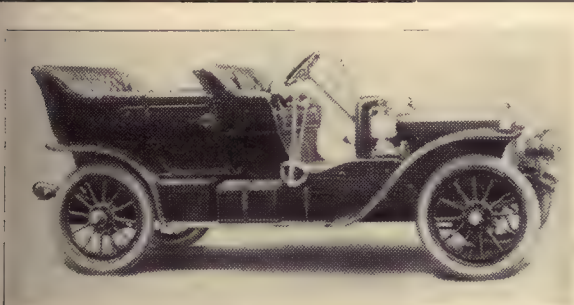
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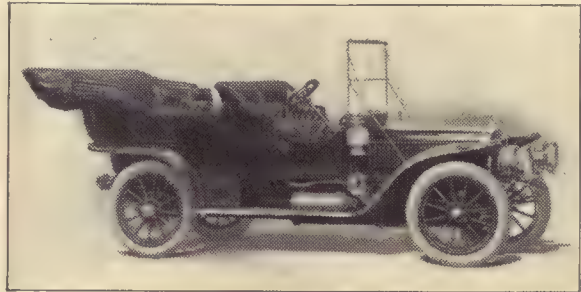
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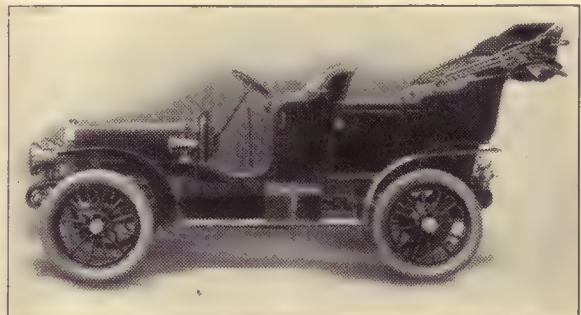
WINTON MODEL M.

Four-cylinder, 40 H. P. motor. 5 inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Multiple-disc clutch and four-speed selective-type transmission. Clutch and transmission run on ball bearings. Shaft drive. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4½-inch tires. Wheel base 112 inches. Gasoline tank, 22 gallons. Seven-passenger body. Original price, \$3500. Bargain price, \$1100 to \$1400.



WINTON SIX-TEEN-SIX

Self-cranking, six-cylinder, 48 H. P. motor. 4½ inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by carburetor throttle. Winton double-jet carburetor. Jump spark ignition, with Eisemann magneto and storage battery. Hancock mechanical oiler. Multiple-disc clutch and three-speed selective-type transmission. Clutch and transmission run on ball bearings. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Four brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 36x4½-inch tires. Wheel base, 120 inches. Gasoline tank, 22 gallons. Seven-passenger body. Original price, \$4500. Bargain price, \$1600 to \$2000.



WINTON MODEL K.

Four-cylinder, 30 H. P. motor. 4¾-inch bore. 5-inch stroke. Water cooled, pump circulation. Motor governed by Winton air control. Winton carburetor. Jump spark ignition, with storage battery and dry cells. Mechanical "shooting" oiler. Individual-clutch transmission. Shaft drive. Floating-type rear axle. One-piece manganese bronze front axle. Screw and nut steering gear. Three brakes. Pressed steel frame. Winton Twin springs. Best hickory wheels, running on roller bearings. 34x4-inch tires. Wheel base 102 inches. Gasoline tank, 15 gallons. Five-passenger body. Original price, \$2500. Bargain price, \$600 to \$800.

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PATENTED

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No. 673,282,
JULY 13TH, 1909,
No. 928,234,
AUGUST 10TH, 1909,
No. 930,405,
AUGUST 10TH, 1909,
No. 930,981.

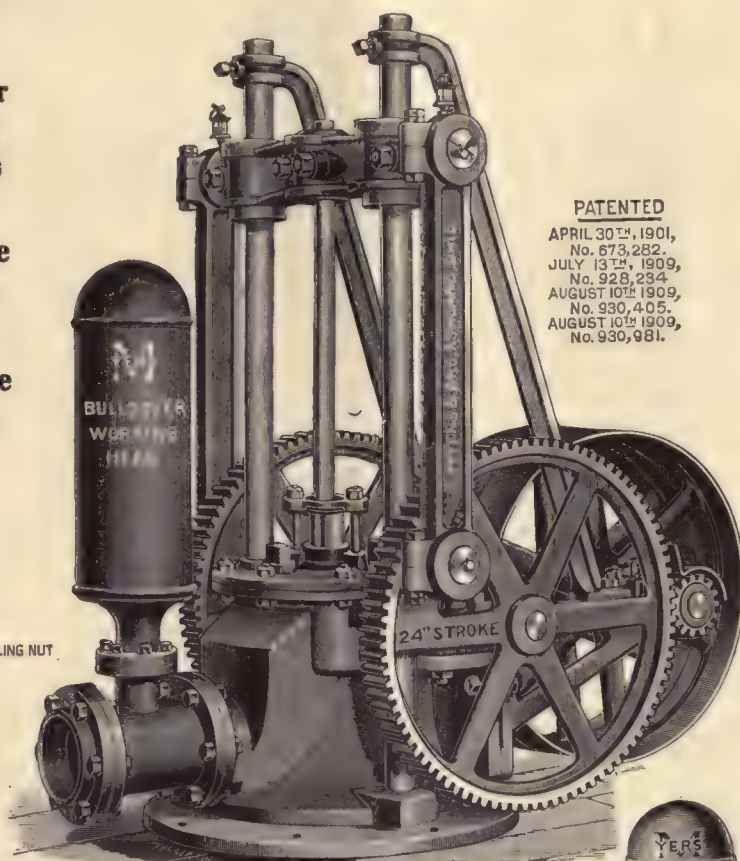
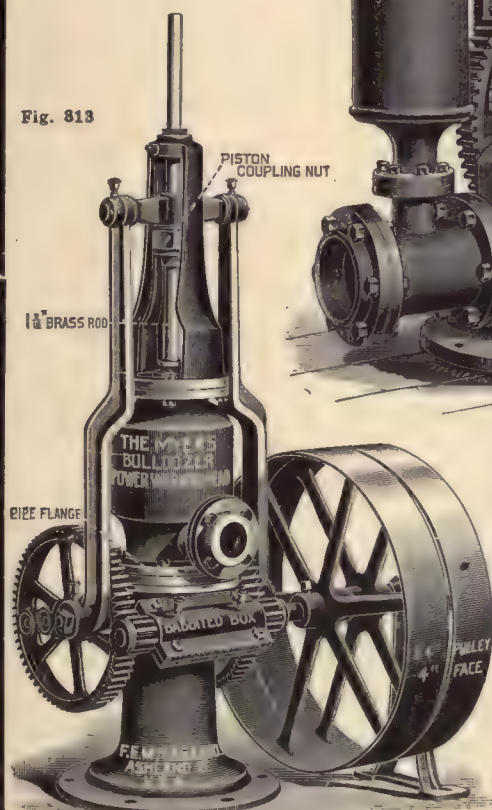
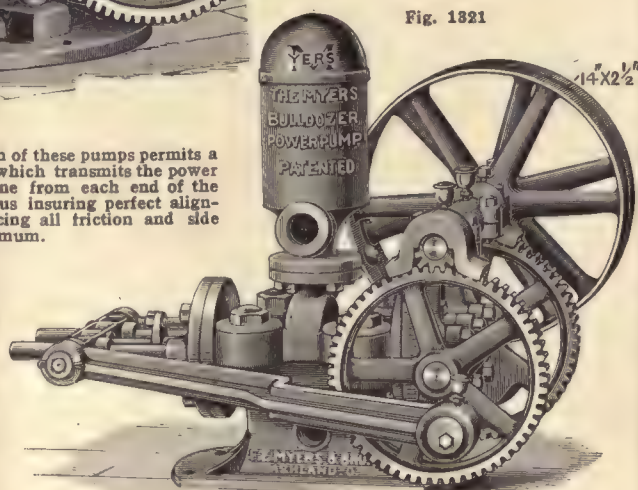


Fig. 1321



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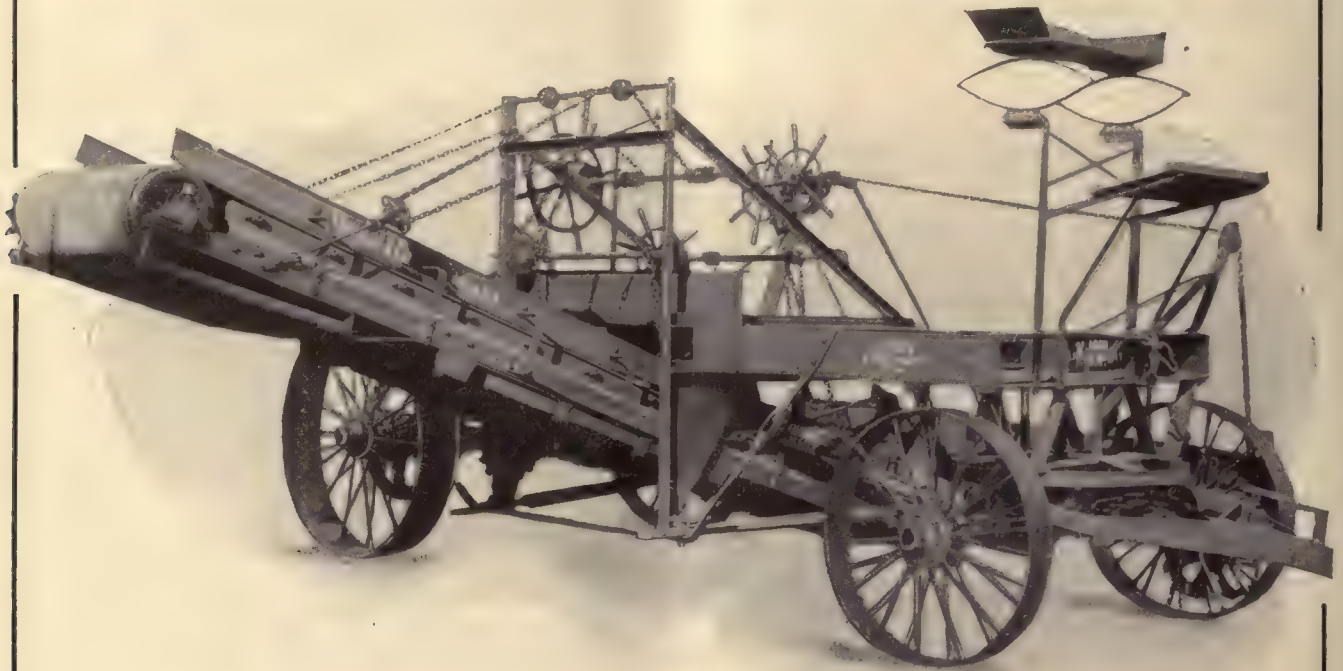
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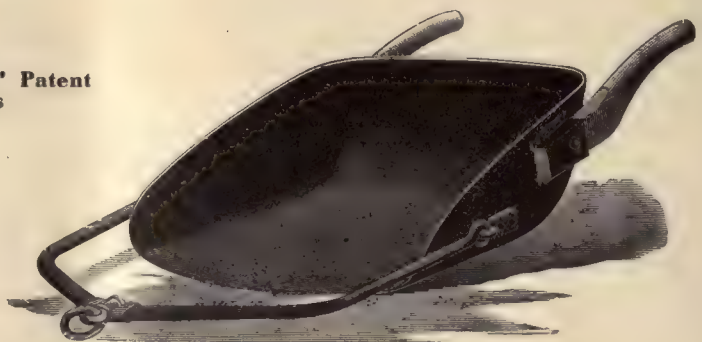
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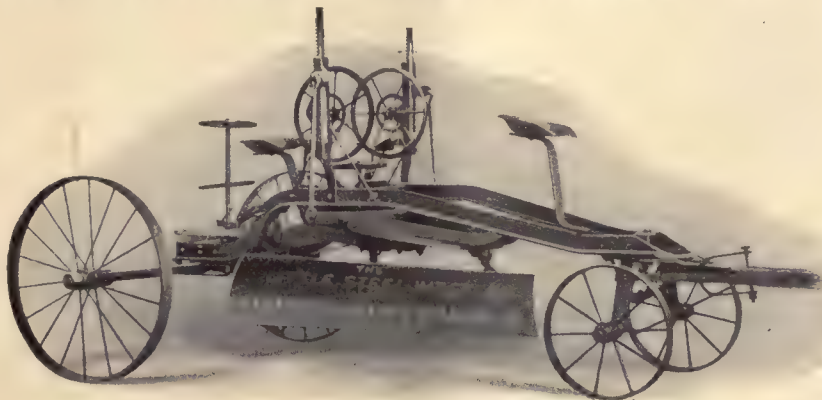
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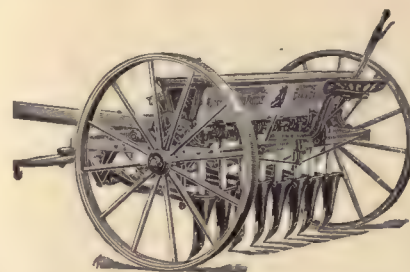
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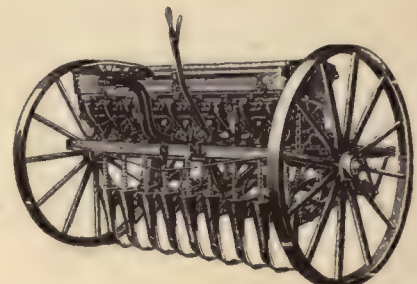
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VOL. XXV

CHICAGO, SEPTEMBER, 1910.

NO. 11

THE IRRIGATION AGE

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THE IRRIGATION ERA

ARID AMERICA

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THE FARM HERALD

IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street,

CHICAGO

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price,
\$2.00. If ordered in connection with subscription, the price is \$1.50.

Getting at the Real Facts About Irrigation

A fact which is not generally known is that the last Congress included in the census act a requirement of the census director that he make a special and detailed report on irrigation. Up to this time the reports by the government on this subject which is of such vital importance to the west have not been considered as entirely full or accurate. The machinery for gathering facts relative to the development of arid lands is sadly out of gear and is not up to the requirements of the times.

The new census act requires the director to find out the areas irrigated, whether such work is being carried on under Government state laws, the prices at which irrigated lands, including water rights, are obtainable; the character and value of crops produced on irrigated land. In addition to this information the report must include detailed information as to the amount of water used per acre, the location of the various enterprises, together with a description of their methods of construction, their physical conditions and the amount of capital invested.

If the director does his duty in this investigation the public will have access to a vast amount of information they have never before had, and it will be of the greatest importance as determining the progress of irrigation and the opportunities for home-making and the investment of capital. It will supply information which should have been promulgated long ago.

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It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 25 years old and is the pioneer publication of its class in the world.

The Men Who Make Up the Irrigation Congress

More interest has been shown generally in the Eighteenth Irrigation Congress than in any previous congress, as evinced by the great number of inquiries regarding its personnel that have come into the office of IRRIGATION AGE. It is surprising to learn that comparatively few business men know just how the delegates are appointed. The official call states that the delegates are to be as follows:

Permanent officers of the congress.
The President of the United States.
The Vice-President of the United States.
Members of the cabinet.
Members of the United States Congress.
Governors of states and territories.
Members of national and state irrigation, water, and conservation associations.
State commissioners of agriculture and horticulture.
The Mayor of each city having a population of over 1,000.
Fifteen delegates appointed by the governor of each state.
Ten delegates by mayor of each city over 25,000.
Five delegates by mayor of each city over 1,000 and under 25,000.
Five delegates by each board of county commissioners.
Two delegates by each mayor of town under 1,000.
Two delegates from each irrigation, agricultural, horticultural and engineering society.
Two delegates from each commercial organization.

The wide scope given in the selection of delegates will undoubtedly accord a representation which will cover every interest and the character of the men selected as already reported is proof that the Congress will be composed of the strongest and most thoughtful men in the country and that every shade of opinion will be represented.

**What Mr.
Schiff
Found in
Alaska**

Jacob H. Schiff, who recently returned from an extended trip through Alaska says the coal used there now comes from British Columbia and sells at \$12 a ton. If Alaska coal could be mined it could be sold in the markets at from \$1.35 to \$3 per ton. Coal mining in the territory is waiting for the establishment by the Government of a policy for the development of the industry. An official bulletin by the Geological Survey of the Government says there has been no development in Alsaka during the past year, in fact there has been actual retrogression in some places. The bulletin adds: "The long delay in the issuance of patents to coal lands and the popular clamor against all Alaskan coal claimants has discouraged claimants and investors, and it should be hoped that it may soon be possible to devise some reasonable or satisfactory means of exploiting Alaska's wealth of coal." This statement coming from a Government source shows greater irritation than Mr. Schiff. It declares that the present laws are a handicap, that though laws "intended to enable the individual to obtain title to coal lands have been on the statute books for the last decade, not a single acre of land has yet gone to patent," and that "it is not surprising that progress has been checked in the coal fields and that many who would undertake their development have become discouraged." The bulletin insists particularly upon the need of railroads to promote all kinds of industries. The suggestion by Mr. Schiff that as a preliminary to opening up the territory which now repels both capital and immigrants, it would be a good plan to arrange for a United States commission to control its development, is sensible. But will it be adopted? And is the coal and other good things of Alaska to be kept buried in the ground for the benefit of generations yet unborn, or will they be released for the people who now live and need them?

**Newell Can-
not Be
Shaken
Loose.**

When the Board of Army Engineers was appointed to look into the reclamation projects and report to President Taft it was given out that they would not be accompanied by any other officer of the Government. Especially was it understood that F. H. Newell, director of the Reclamation Service would not be permitted to go along and inject his peculiar political methods into the work of the army board. This was a sad blow to Newell, who saw his control of the work slipping from his grasp and he at once began to pull the wires to enable him to hold on. That he succeeded is not to be wondered at by anybody who is conversant with his methods. He left Washington very quietly, it being given out by his subordinates that he was simply going on a trip of inspection on his own account, but he turned up at Salt Lake with the army engineers and is now touring the country with them. His success in pulling the wires in his favor is noted in a dispatch from Washington which states that "the change in the department's original attitude, which by many was attributed to the strained relations existing between the office of the Secretary and the Reclamation Service, was due to pressure from other and powerful quarters." The presence of Mr. Newell is not in the least necessary for the guidance of the army board. The members of the board should be left entirely to their own investigation and their judgment from the conditions as they see them. It is not our intention to intimate that Newell will have

any improper influence with the army board, because its members are men of experience and good judgment and will, no doubt, report the facts as they find them; but that Newell will, by every means in his power, attempt to sway their judgment by his activities and specious reasoning and information is not to be doubted by any one who knows him.

**Timely
Warning to
American
Farmers**

Consul William E. Alger, of Mazatlan, Mexico, has done the farmers of this country a timely service in an official warning which he has recently sent out, urging them not to be lured by promises of comfortable homes and fortunes in tropical lands to give up their citizenship here without the most careful investigation. Mr. Alger says that men who are not accustomed to the labor, the climate and language of Mexico would be hopelessly lost when facing the new and strange conditions in Sinaloa. Colonization companies are sending out the most alluring promises to American farmers urging them to sell their farms and take up small tracts of 100 to 200 acres in that country, assuring them that they will soon become prosperous and happy.

Mr. Alger says American farmers will be wise if they first make sure by personal observation that all the promises of climate, cheap labor, plenty of rainfall and good markets with ample and cheap transportation may actually be fulfilled. They should fully understand that for the first few years they must rough it and roughly at that; that there are no schools, no society, that a knowledge of the language must be had, that capital is required and that hardships must be endured. No man who does not possess youth, great courage and ample capital can hope to succeed in that country.

It is not asserted that opportunities do not exist in that country, but before a man in the United States sells his farm and gives up his home and friends to go down there to make a new home for his family he should first look into the situation personally. And, too, he must believe only what he actually sees and not what he hears, because there are many people there who have learned the rueful facts and being anxious to unload on somebody else who is ignorant of them, will not hesitate to distort the conditions. Why will our American farmers persist in leaving the land of the greatest freedom and opportunity in the world to seek doubtful fortune in a strange country? By such men the warning sent by Mr. Alger ought to be seriously considered.

**Sane
Conservation
and the
Other Kind**

Judging from the intemperate expressions of some newspapers and public speakers in Congress and out, one not familiar with the subject might think that conservation is an entirely new movement and one that had its origin in the minds of that class of men who have been exploiting it for the sole benefit of themselves and their friends. Mr. Pinchot claims that his father was the first man to promote the idea of conservation and that he left it as a blessed heritage to his son, who now sets himself up as the only inspired authority on the subject. The plain truth is that conservation in the science of government is centuries old. In our own country Major Powell began stirring up the conservation and irrigation question in

1878, and the first concrete legislation to conserve the forests was under President Cleveland. The irrigation act passed in 1902 had been vigorously advocated by Major Powell for years, and if we go back to the real origin of conservation in this country we would have to start in prehistoric times.

Forestry is one of the oldest sciences in Europe. Dry farming has been practised in Scotland for more than 200 years, and it is certain that irrigation was practiced in America before Columbus arrived. As in most great movements there are a few badly balanced enthusiasts who now lay claim to everything in sight and go far beyond reason in their advocacy of the conservation movement. During the past five years there has been a great hurrah and a deal of shouting by these enthusiastic and self-appointed conservators of conservation, and with it all there has been a tremendous amount of misinformation. These men, impatient of restraint and intolerant of any opinion which does not agree with their own and wholly lacking in restraint or good judgment, demand the adoption of their own ideas to the exclusion of all others, and to the great detriment of the movement.

It is to the sane and temperate judgment and action of those who have given the subject intelligent study, and who are behind it because they know its real value and are not trying to exploit it for political or private purposes, that we must look for real and permanent results. The shouters will tire themselves out in time and turn their attention to something else and then the solid backers of conservation will move forward and in the right direction as they always have. The people all believe in conservation. Who does not? But they believe in sane and reasonable methods and in the principle that the benefits to come from it should not be confined to those who are to come after us in future centuries, but that the people who are now on earth should be considered as beneficiaries.

We may expect to hear a great deal of inefficient enthusiasm expended in the Pueblo congress on this subject, and the men who stand for conservative methods and who appreciate the vast breadth and importance of the conservation movement will come in for volumes of criticism, possibly abuse; but nothing of this kind can swerve them from the plain path that has been marked out by them and the great majority of the people who, in sympathy and understanding, are backing them.

**President
Taft's
St. Paul
Speech.**

President Taft, in his address before the National Conservation Congress at St. Paul, promulgated a policy which will have the hearty support of every true friend of conservation. His address gave evidence of the most careful study of the whole question and furnished much food for thought to every person who is interested in it. His position is clearly defined, and if his policy can be carried out it will result in the greatest possible good to the entire country.

The President did not assume to dictate to the Congress just what it should or should not do and frankly stated that on some minor points his mind had not been clearly made up. The tenor of his address was pacific and cleared up many points on which the public had heretofore been in some doubt. The President very wisely refrained from recriminations or criticism of persons or performances but frankly praised what has already been done and spoke most hopefully of what is

yet to be accomplished. He unqualifiedly condemned the policy of Federal control of all conservation interests when he said: "I am firmly convinced that the only safe course for us to pursue is for us to hold fast to the limitations of the constitution and to regard as sacred the powers of the states. In these days there is a disposition to look too much to the Federal government for everything."

Although the President mentioned no names in his address, Gifford Pinchot and his rabid followers came in for deserved rebuke in the following sentence: "I am bound to say that the time has come for a halt in general rhapsodies over conservation, making the word mean every known good in the world, for after the public attention has been aroused such appeals are of doubtful utility." The country now knows just where the President stands on conservation, and although he has been criticized for tardiness in pushing conservation measures, he made it perfectly clear that he intends to advance legislation of this character as rapidly as possible. It will not be an easy matter to enact the conservation measures indicated in his address, but his frank and manly words will do much toward concentrating public thought and giving fresh energy to public opinion and in this way force Congress to meet the issue fairly.

The friends of true conservation will rejoice at the President's attitude in regard to Federal interference with State rights.

The natural resources in which the Federal government has an ownership are nevertheless as much subject to the sovereignty of the states in which they are located as any property owned by private interests. It is absurd to assume that the states cannot be trusted to protect their own resources, and it is folly to believe that the unreasonable demands of Pinchot and Garfield will be acceded to.

The coal lands, water power sites and the forests should be devoted to the use of the people now with due regard of course to the interests of future generations, but Pinchot and his followers would, if their policy should be carried out, tie up these great sources of wealth until the present generation has passed away. It is impossible that this policy can ever receive the support of the thinking people of this country, and particularly those people who are interested in the development of the West. The states should be trusted to protect their own interests, as they are perfectly capable of doing without the dangerous intervention of the Federal government.

**Frederick H.
Newell a
Good
Politician.**

We have said something before relative to the ability of certain politicians who have been developed by some of the bureaus at Washington. We wish to specialize at the present time and to call attention to one Frederick Haynes Newell, formerly employed for a few months in a mine in Colorado, for a few months more in a coal mine in West Virginia and since then a humble servant of the people. He became attached to the U. S. Geological Survey about twenty-two years ago. He entered the best training school for politicians that the Government has thus far founded. His field experience and his education were along mining lines. He doubtless entered the Geological Survey with the intention of pursuing further his geological work. Opportunities are numerous for those who take advantage of every favorable wind. Mr. Newell was never known to miss anything in this direction. The Hydrographic Division of the Geological Survey grew up under

Mr. Newell's management. His department had such abnormal growth that in a few years the "tail wagged the dog," according to the verdict of those who were acquainted with the situation.

The public has always been kept informed as to Mr. Newell and his work. He has been strong on the publicity idea and he has always kept his ear close to the ground. From 1895 until a year or so ago Mr. Newell, Mr. Gifford Pinchot and Mr. George H. Maxwell made up a little triumvirate that has never been excelled in publicity practices. Mr. Maxwell was employed by the transcontinental railroads to lobby and advertise everything and everybody that favored national irrigation. He organized all kinds of associations. The National Irrigation Association, the National Manufacturers' Association and many others had their birth in his fertile mind. Press bureaus were so thick at Washington that they overlapped. Mr. Maxwell advertised both Mr. Pinchot and Mr. Newell. Mr. Pinchot advertised Mr. Newell and both Mr. Pinchot and Mr. Newell aided Mr. Maxwell in all of his undertakings of mutual concern. Those who attended sessions of the National Irrigation Congress or the Trans-Mississippi Commercial Congress during the past fifteen years will remember how the Pinchot-Newell-Maxwell machine worked. The committees in charge of each congress would be relieved of much of the responsibility of advertising and arrangement of program by taking advantage of the help offered by this self-appointed committee of three. Things would be "fixed" weeks before delegates began to arrive. No opposition could develop enough strength to get a hearing even before a committee. The organization prior to the session of the congress was complete and effective. Politicians who favored all that these men indorsed easily secured a place on the program, and the congress degenerated into a plaything.

While these political moves were being made, the press bureaus at Washington did not lose sight of the fact that national irrigation might soon be a realization. Of course, Mr. Newell was the man to take charge of this work. He had the necessary training in the bureaus and he had the political strength that can only be obtained by publicity. Mr. Newell's case reminds us that this bureaucratic publicity always avoids the whole truth. We have never found any truthful review coming from this source as to Mr. Newell's actual training and experience. These press bureaus never said that his only experience in the field consisted of a few months' work in mines. They never informed the eager public that Mr. Newell had never surveyed a ditch or reservoir and had not even laid out a lateral. He had simply been at the head of a political division of a greater political department. Mr. Newell was afraid that some competent man might show up from the West, where irrigation experience might have trained an engineer for this important government work.

He was afraid of Dr. Elwood Mead, the greatest irrigation expert in the world today, who has taken charge of irrigation for the Australian Government. We could show by example how Mr. Newell directed all of his political strength to prevent Dr. Mead from being considered a possibility. We should like to have the findings of a certain commission appointed to report on the advisability of a re-subdivision of the scientific work of the government, made public. We should like the names of the members of this commission to be placed where all may read them. We should like to know why this com-

mission was appointed. On whose recommendation was President Roosevelt led to appoint such a commission? Why, after months of "investigation" and after the report was prepared, was it smothered? Does Mr. Newell remember a meeting of this commission at the home of Mr. Pinchot in Washington, in July, 1903? Was Mr. Garfield there? Was the Director of the U. S. Geological Survey there?

The press bureaus at Washington, were in the meantime, doing great things. Mr. Maxwell was also exerting himself. The eastern press was regaled with stories of Mr. Newell's prowess. In the face of these misrepresentations it was plain to the casual observer that Mr. Newell would land the position he sought. Because of his advertising system and his influence with the President through Mr. Pinchot, he was appointed by Mr. Hitchcock as Chief Engineer of the Reclamation Service. When Mr. Garfield was appointed Secretary of the Interior, a new era opened for Mr. Newell. Mr. Garfield had helped Mr. Newell before. Because the Reclamation Service was at first under the Geological Survey, this placed Mr. Walcott in charge, although it was understood that Mr. Newell was to have a free hand. Mr. Walcott was quietly let out and given a berth in the Smithsonian Institute. Mr. Newell was made temporary Director of the Geological Survey and then the Reclamation Service as it is known today was organized. Mr. Newell went with the new organization as Chief Engineer, but this title was evidently a misfit, even to him, so that he was later made Director of the Reclamation Service while a civil engineer became Chief Engineer.

So ably have the press agents at Washington continued their labors that the public is as fully misinformed as to the progress of national irrigation as it was as to the merits of Mr. Newell. What has been accomplished? Instead of taking up some small projects which could be hurried to completion and from which the funds spent would begin to return quickly, Mr. Newell proceeded to spread himself out in the construction of engineering monuments throughout the West. Irrigation development and opportunities for homes has been a secondary object. The main thing has been to get something big started. Mr. Newell long since discovered that tenure of office often depends upon the volume of unfinished work. The result is that no project has been completed. Settlers have been waiting years for water. Mr. Newell's friends admitted when he was first appointed that he did not pretend to be an irrigation engineer, but that he was a great organizer. He is an organizer as well as an advertiser. He organized the Reclamation Service so thoroughly that his organization has cost about one-fourth as much as he has spent for construction. Where private parties build irrigation works and defray the expense of organization with an outlay equal to from five to eight per cent of the total cost of the work, Mr. Newell has spent from 25 to 35 per cent. As his organization grew, it became more valuable to him as a political asset. He called his engineers to Washington every winter and paraded them about for political effect. He kept Congressmen informed as to his progress by personal interviews, reports, lectures, lantern slides and by keeping his press bureau in good running order. Why there should be an office in Washington, except for disbursing funds, was never plain to western people. It is unnecessary, except for its political value.

Recently the President has deemed it wise to place

the construction of irrigation works under the charge of Army Engineers. It is not apparent at this time what effect this is to have on Mr. Newell's position as Director of the Service. Most men would have resigned on the spot when the appointive power indicated that the service might be improved by placing the responsibility in other hands. Not so with Mr. Newell. He congratulated the Army Engineers, telling them that they are to take a great load from his shoulders, etc. He proceeds to conduct these Army Engineers through the West to make them acquainted with the work in hand. He will not lose this opportunity to make himself as solid as conditions will permit, with the new management. In the meantime his publicity department is telling the people what has been accomplished to date. This is for the benefit of Mr. Newell. It is timely advertising.

Something should be done to check the publicity work of the bureaus at Washington. All departments there should be on the same basis in so far as publicity is concerned. To those who can in any way indorse this practice we ask, what kind of a government would we have if every officer, great and small, would spend his time attending conventions, talking from the platform and writing material for personal and political advertising? It is plain that this would be dangerous. Where are we to draw the line? Can we permit one officer to initiate a practice that would manifestly lead to anarchy if the same policy were adopted by all? If by replacing the present organization of the Reclamation Service with Army Engineers, this publicity practice can be checked to some extent, the change should be welcomed. Let us have more construction and less organization and less political activity.

RECLAMATION FUND BILL

Full Text of the Measure Providing for Advances of \$20,000,000 and How the Money Shall Be Spent.

FOLLOWING is the complete text of the bill to provide \$20,000 to complete irrigation projects already commenced and the issue and disposal of bonds:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That to enable the Secretary of the Interior to complete government reclamation projects heretofore begun, the Secretary of the Treasury is authorized, upon request of the Secretary of the Interior, to transfer from time to time to the credit of the reclamation fund created by the act entitled "An Act appropriating the receipts from the sale and disposal of public lands in certain states and territories to the construction of irrigation works for the reclamation of arid lands," approved June 17, 1902, such sum or sums, not exceeding in the aggregate twenty million dollars, as the Secretary of the Interior may deem necessary to complete the said reclamation projects, and such extensions thereof as he may deem proper and necessary to the successful and profitable operation and maintenance thereof or to protect water rights pertaining thereto claimed by the United States, provided the same shall be approved by the president of the United States; and such sum or sums as may be required to comply with the foregoing authority are hereby appropriated out of any money in the treasury not otherwise appropriated:

Provided, That the sums hereby authorized to be transferred to the reclamation fund shall be so transferred only as such sums shall be actually needed to meet payments for work performed under existing law: *And provided further,* That all sums so transferred shall be reimbursed to the Treasury from the reclamation fund, as hereinafter provided: *And provided further,* That no part of this appropriation shall be expended upon any existing project until it shall have been examined and reported upon by a board of engineer officers of the Army, design-

nated by the President of the United States, and until it shall be approved by the president as feasible and practicable and worthy of such expenditure; nor shall any portion of this appropriation be expended upon any new project.

Sec. 2. That for the purpose of providing the Treasury with funds for such advances to the reclamation fund, the Secretary of the Treasury is authorized to issue certificates of indebtedness of the United States in such form as he may prescribe and in denominations of fifty dollars, or multiples of that sum; said certificates to be redeemable at the option of the United States at any time after three years from the date of their issue and to be payable three years after such date, and to bear interest, payable semi-annually, at not exceeding three per centum per annum; the principal and interest to be payable in gold coin of the United States. The certificates of indebtedness herein authorized may be disposed of by the Secretary of the Treasury at not less than par, under such rules and regulations as he may prescribe, giving all citizens of the United States an equal opportunity to subscribe therefore, but no commission shall be allowed, and the aggregate issue of such certificates shall not exceed the amount of all advances made to said reclamation fund, and in no event shall the same exceed the sum of twenty million dollars. The certificates of indebtedness herein authorized shall be exempt from taxes or duties of the United States as well as from taxation in any form by or under state, municipal, or local authority; and a sum not exceeding one-tenth of one per centum of the amount of the certificates of indebtedness issued under this act is hereby appropriated, out of any money in the Treasury not otherwise appropriated, to pay the expense of preparing, advertising, and issuing the same.

Sec. 3. That beginning five years after the date of the first advance to the reclamation fund under this act, fifty per centum of the annual receipts of the reclamation fund shall be paid into the general fund of the Treasury of the United States until payment so made shall equal the aggregate amount of advances made by the Treasury to said reclamation fund, together with interest paid on the certificates of indebtedness issued under this act and any expense incident to preparing advertising, and issuing the same.

Section 4. That all money placed to the credit of the reclamation fund in pursuance of this act shall be devoted exclusively to the completion of work on reclamation projects heretofore begun as hereinbefore provided, and the same shall be included with all other expenses in future estimates of construction, operation, or maintenance, and hereafter no irrigation project contemplated by said act of June 17, 1902, shall be begun unless and until the same shall have been recommended by the Secretary of the Interior and approved by the direct order of the President of the United States.

Sec. 5. That no entry shall be hereafter made and no entryman shall be permitted to go upon lands reserved for irrigation purposes until the Secretary of the Interior shall have established the unit of acreage and fixed the water charges and the date when the water can be applied and made public announcement of the same.

Sec. 6. That section nine of said act of Congress, approved June 17, 1902, entitled "An act appropriating the receipts from the sale and disposal of public lands in certain states and territories to the construction of irrigation works for the reclamation of arid lands," is hereby repealed.

Approved, June 25, 1910.

JUDGE KINNEY'S NEW BOOK.

JUDGE CLESSON S. KINNEY, of Salt Lake City, Utah, is now engaged in preparing a work on the legal side of irrigation. A work that is greatly needed by every man interested in the development of arid lands. This book will be issued very soon and it consists of three volumes in the usual legal form. Judge Kinney is the author of other valuable works on irrigation, the last volume appearing in 1893. IRRIGATION AGE has made arrangements with Judge Kinney by which all inquiries received by us will be forwarded to him and his replies will be published in these columns.

Politicians in Control at St. Paul

Second Conservation Congress Adopts the Demands of Federal Hysterical Enthusiasts and Ignores States Rights

THE second National Conservation Congress held at St. Paul, September 6th, was simply another manifestation of the purpose of the federal crowd of politicians to dominate as far as possible all public utterances regarding federation matters.

The congress was in control of the politicians from beginning to end, and the friends of real conservation and states' rights, foreseeing on the first day that they were powerless to bring the congress to a proper sense of its duty to the public in a sane and reasonable discussion of conservation matters, quietly sat by and allowed the federal crowd of bureaucrats and politicians to continue their narrow and dictatorial policy, practically unopposed.

There was, however, a decided stand made by President Taft's friends in the Committee on Resolutions when they forced the majority to cut out the name of Theodore Roosevelt and his name did not appear in the resolutions as presented to the congress. Henry Hardtner, of Louisiana, declared that the conservation principles favored by the Congress were no more those of Roosevelt's than Taft's. He declared that the meeting was much less of a conservation movement than a state political meeting which had for its purpose the exaltation of Theodore Roosevelt at the expense of President Taft.

The Congress adjourned on Thursday evening after the election of the following officers:

President, Henry Wallace, of Des Moines, editor of *Wallace's Farmer*, and a member of the Country Life Commission, appointed by Roosevelt, when he was president. Secretary Thomas Shipp, re-elected; treasurer, Dr. Austin Latchaw of Kansas City.

The name of Gifford Pinchot and J. B. White, chairmen of the executive committee, had both been mentioned for the presidency but both declined,

Pinchot stating that he did not think his election would be in the interest of harmony. Pinchot asked that Captain White be retained as chairman of the executive committee and this was done. If the slate as first proposed had gone through with White as president, Alfred L. Baker of Chicago, would have been elected chairman of the committee as he had been promised the support of a number of state delegations.

The congress was opened by President Taft whose speech was one of the most notable and dignified declarations defining his policy in all matters pertaining to conservation. President Taft urged a spirit of conciliation and progress and declared that he should do everything in his power to help the people realize a great national ambition.

Roosevelt Opposes Taft's Policy.

Theodore Roosevelt was the principal speaker on Wednesday. He, of course, opposed President Taft's policies and declared unequivocally for Federal control of all natural resources. He made an attack on certain delegates to the congress without naming them, intimating that they were the paid agents of special interests. He claimed that there is a distinct tendency on the part of his opponents to cloud the issue by raising the question of State as against Federal rights and vigorously asserted that he was ready to meet that issue if it was forced upon him.

Gifford Pinchot declared in a somewhat offensive manner that the Federal crowd was now in full power and that the control would not be lost. He praised Roosevelt in the most fulsome manner and declared that he was responsible for the entire conservation movement. James A. Garfield followed in a more temperate strain but his speech was along the same line.

A great deal of excitement was caused at one stage of the proceedings by the announcement that President B. N. Baker had appointed Edward Hines, the Chicago lumberman, to the chairmanship of the Committee on Credentials. When this became known the Illinois delegation attempted to have President Baker reverse his action and a resolution declaring that Hines ought not be permitted to act in that capacity was actually adopted by the delegation. This created a tremendous row and Hines announced that he would not withdraw his name but would fight to retain the chairmanship.

The Illinois men who had repudiated Hines were taken off their feet by the announcement that the report of the Credential Committee had been adopted and before they

had an opportunity to present their resolution to the congress. President Baker then explained that it was all a mistake, that Hines had never been appointed chairman of the Credentials Committee and was not even a member of it. Some one had handed President Baker a paper on which Mr. Hines' name appeared at the top. President Baker however paid no attention to this and appointed G. E. Condra of Nebraska.

James J. Hill, president of the Great Northern Railway, made a vigorous speech in favor of state's rights and declared that the "need of the hour is to conserve conservation." He said the time is ripe to distinguish between real and fanciful conservation. The national machine is too big, distinct, slow, cumbersome and costly and irrigation would have been more cheaply done if

President Taft's Views on Conservation

In these days there is a disposition to look too much to the federal government for everything. I am liberal in the construction of the constitution with reference to federal power; but I am firmly convinced that the only safe course for us to pursue is to hold fast to the limitations of the constitution and to regard as sacred the powers of the states.

It needed some one to bring home the crying need for a remedy of this evil so as to impress itself on the public mind and lead to the formation of public opinion and action by the representatives of the people. I prize my high opportunity to do all that an executive can do to help a great people realize a great national ambition.

Real conservation involves wise, non-wasteful use in the present generation, with every possible means of preservation for succeeding generations; and though the problem to secure this end may be difficult, the burden is on the present generation promptly to solve and not to run away from it as cowards, lest in the attempt to meet it we make some mistake.

I beg you, therefore, when men come forward to suggest evils that the promotion of conservation is to remedy, that you invite them to point out the specific evils and the specific remedies; that you invite them to come down to details in order that their discussions may flow into channels that shall be useful rather than into periods that shall be eloquent and entertaining without shedding real light on the subject.

We must steer away from this idea of conserving for future generations only. We must take care of the present as well.

I am bound to say that the time has come for a halt in general rhapsodies over conservation, making the word mean every known good in the world; for, after the public attention has been roused, such appeals are of doubtful utility and do not direct the public to the specific course that the people should take, or have their legislators take, in order to promote the cause of conservation.

The rousing of emotions on a subject like this, which has only dim outlines in the minds of the people affected, after a while ceases to be useful, and the whole movement will, if promoted on these lines, die for want of practical directions and of demonstration to the people that practical reforms are intended.

turned over to private enterprise or to the several states "What the United States needs," said Mr. Hill, "is neither reckless destruction nor an embargo upon our splendid western commonwealths by locking up a considerable portion of this one available area. The use of water within the state is the property of the state and cannot be taken from it."

Clash Between California Men.

The big sensation of the last day came in the meeting of the Resolutions Committee in a verbal battle which almost became a fist fight between Frank H. Short of California and Ex-Governor Pardee of the same state. Mr. Short, who had vigorously supported states' rights, advocated a favorable plank in the resolution and declared that unless it was inserted he would fight for it on the floor of congress.

"You can afford to," said Governor Pardee. "You're paid for it. You and your \$20,000 a year and fees should want to fight it."

"When I get home I'll make you prove that, Governor Pardee," shouted Short.

"I will," was the answer. The two glared belligerently at each other, but were kept apart.

that there is rapidly developing a segregation in the ranks of business men. He believes that there is a gradual evolution of the moral sense, and a permanent advance in the idea of social justice and it is a manifestation of a principle which will soon become effective and ultimately provide for the greatest good to the greatest number.

Francis J. Heney, the San Francisco graft prosecutor, attacked James J. Hill and declared that there are evidences that public opinion in this country does not have a free chance to operate. He intimated broadly that men like Hill controlled legislatures in some of the western states and therefore were naturally in favor of states' rights because they could have the disposition of natural resources in their own hands. Heney charged that the big interests were most powerful in dictating the appointment of district attorneys and that it is almost impossible to punish rich and powerful men who violate the laws and dispoil the natural resources of the country.

Henry S. Graves, United States forester, said that the conservation movement is at a critical period in its history and presents many problems difficult of solution. He said he was now trying to work out a plan for the development of the water power of the west by private capital while still protecting the people's interest. Other



Part of Reservoir No. 2, on the Maxwell Irrigated Land Company's Holdings, near Maxwell, New Mexico.

The other sensation was launched by Henry Hardtner of Louisiana, chairman of the conservation association of that state. He called a meeting of the conservation commissioners of the various states in the morning and there declared that the congress had paid more attention to politics than to conservation, and that even then there was being considered in the resolutions committee a move to indorse Colonel Roosevelt and ignore President Taft in the resolutions.

"If this is done it will be an insult to the president," he declared, "and I'll fight it in the congress."

The principal speech on the last day of the session was by President Alfred L. Baker of Chicago on "The Stake the Business Man Has in Conservation." Mr. Baker gave Grover Cleveland credit for energizing the conservation movement as early as 1888, and declared that of the combination of capital described by him then has been followed by a tremendous growth in the combination of capital and industry.

President Baker is Hopeful.

Mr. Baker pointed out the dangerous activity in our political arena of the agents and members of these corporations. The conditions they are precipitating form a political and economic crisis, but he sees hope in the face

speakers of the day were John Barrett, director general of the Pan-American Union; Judge Short of California, and Gifford Pinchot.

A negligible effort was made by the Illinois delegation to bring the next congress to Chicago but that question will be settled in the legislative committee to be held some time later. Washington, D. C.; Rochester, N. Y., and Kansas City, Mo., are all trying to secure the next congress. The platform as adopted by the congress is as follows:

Platform of the Congress.

Heartily accepting the spirit and intent of the Constitution and adhering to the principles laid down by Washington and Lincoln, we declare our conviction that we live under a government of the people, by the people, for the people, and we repudiate any and all special or local interests or platforms or policies in conflict with the inherent rights and sovereign will of our people.

Recognizing the natural resources of the country as the prime basis of property and opportunity, we hold the rights of the people in these resources to be natural and inherent, and justly inalienable and indefeasible, and we insist that the resources should and shall be developed, used and conserved in ways consistent both with current welfare and with the perpetuity of our people.

Recognizing the waters of the country as a great national resource, we approve and indorse the opinion that all the waters belong to all the people and hold that they should be used in the interest of the people.

Realizing that all parts of each drainage basin are related and interdependent, we hold that each stream should be regarded and treated as a unit from its source to its mouth, and since the waters are essentially mobile and transitory and are generally interstate, we hold that in all cases of divided or doubtful jurisdiction the waters should be administered by co-operation between state and federal agencies.

Recognizing the interdependence of the various uses of the waters of the country, we hold that the primary uses are for domestic supply and for agriculture through irrigation or otherwise, and that the uses for navigation and for power, in which water is not consumed, are secondary; and we commend the modern view that each use of the waters should be made with reference to all other uses for the public welfare in accordance with the principle of the greatest good to the greatest number for the longest time.

Viewing purity of water supply as essential to the public health and general welfare, we urge upon all municipal, state and federal authorities and on individuals and corporations requisite action toward purifying and preventing contamination of the waters.

Approving the successful efforts of the United States to provide homes on arid lands through irrigation, we endorse and commend the reclamation service and urge its continuance and the extension of the same policy to the drainage of swamp and overflow lands, to be carried forward so far as appropriation through co-operation between states and federal agencies.

Viewing adequate and economical transportation facilities as among the means of conservation, and realizing that the growth of the country has exceeded the development of transportation facilities, we approve the prompt adoption of a comprehensive plan for developing navigation throughout the rivers and lakes of the United States, proceeding in order of their magnitude and commercial importance.

Recognizing the vast economic benefit to the people of water power derived largely from interstate sources and streams no less than from navigable rivers, we favor federal control of water power development; we deny the right of states or federal government to continue alienating or conveying water by granting franchises for the use thereof in perpetuity, and we demand that the use of water rights be permitted only for limited periods with just compensation in the interests of the people.

We demand the maintenance of the federal commission empowered to deal with all uses of the waters, and to co-ordinate these uses for the public welfare in co-operation with similar commissions or other agencies maintained by the states.

Approving the withdrawal of public lands pending classification and the separation of surface rights from mineral, forest and water rights, including water power sites, we recommend legislation for the classification and leasing for grazing purposes on unreserved public lands suitable chiefly for this purpose, subject to the rights of homesteaders and settlers, or the acquisition thereof under the laws of the United States, and we hold that arid and nonirrigable public grazing lands should be administered by the government in the interest of the small stockmen and homeseekers until they have passed into the possession of actual settlers.

We hold that the deposits of minerals underlying, particularly mineral fields, iron ores and phosphate deposits, should be leased for limited periods not exceeding fifty years, but subject to renewal, the royalty to be adjusted at more frequent intervals, such leases to be in amounts to such regulations as to prevent monopoly and unnecessary waste.

We hold that phosphate deposits underlying the public lands should be safeguarded for the American people by appropriate legislation and we recommend the early opening of the Alaskan and other coal fields belonging to the people of the United States for commercial purposes on a system of leasing, national ownership to be retained.

We urge immediate investigation by the federal government of the damage done by the smelting of copper ores and the feasibility of so improving methods as to utilize the injurious by-products in connection with phosphatic fertilizers.

We favor co-operative action on the part of states and the federal government looking to the preservation and better utilization of the soils by approved scientific methods.

We approve of the continuance of the control of the national forest by the federal government, and approve the policy of restoring to settlement such public lands as are more valuable for agriculture.

We earnestly recommend that the states and federal government acquire for reforestation lands not more valuable for other purposes, and that all existing forests publicly and privately owned be fully protected by state and federal governments. We recognize the invaluable services of the forest service to the people and earnestly recommend that it be more generously supported by the federal government, and that state, federal and private fire patrol be more generously provided for the preservation of forests and human life; and appreciate and approve of the continuance of the service of the United States army in fire patrol in emergencies.

We favor the repeal of the timber and stone law.

We endorse the proposition for the preservation by the federal government of the Southern Appalachian and White Mountain forests.

We recommend that the federal government conserve migratory birds and wild game animals.

We recommend the adequate maintenance of a national conservation commission to investigate the natural resources of the country and co-operate with the work of the state conservation commissions; and we urge the legal establishment and maintenance of conservation commissions or corresponding agencies on the part of all states of the Union.

Nothing in these resolutions to be construed as questioning the rights of the states or the people of the United States guaranteed under the federal constitution.

ARID AGRICULTURE

BY

B. C. BUFFUM, M. S.

Manager of the Wyoming Plant and Seed Breeding Company, Worland. Former Professor of Agriculture in the University of Wyoming and the Colorado Agricultural College, and Director of the Wyoming Agricultural Experiment Station.

Methods in Irrigation.



PROF. B. C. BUFFUM.

The easiest and crudest methods were adopted in the earlier days of irrigation. In sections of India and Egypt, which are thought to be the oldest among irrigated countries, the practice of irrigation has remained almost the same for centuries. Primitive appliances are still in use, such as buckets on sweeps, and other simple animal-power machines for lifting water from the streams or wells to the height of the crop land. In contrast with this is the rapid development of irrigation practice in the Western States. The beginning of irrigation in this country was in 1847, when the Mormons made the great experiment at Salt Lake City little more than a half century ago. Since then development and improvement have been rapid, though many reverses were met with by the pioneers. Now, new methods are proving so superior to the old, that the farmer who would make the most of his land must keep abreast of the times and adopt the more progressive ideas.

Local Methods.

Many localities are characterized by some general method of irrigation. Sometimes this is a good method for the local conditions and sometimes not. Usually the pioneer has marked out his own system without help. Those who come at a later date take up the local practice and retain it, even though they may see other localities forging ahead of them.

The Irrigator's Problem.

Crops require water to grow or even to remain alive. The irrigator with a reliable and sufficient water supply has a great advantage over every other agriculturist. He has it within his power to govern the application of water to his fields, to apply it when and where he wishes and in the quantity he thinks best. These advantages bring with them the necessity of learning how to make the most profitable use of the water supply. The problem of the irrigator is to apply water in the right place at the right time, in quantities that will give the best results, and by the most efficient and economical methods. Local conditions and the kind of crop grown should determine the method most applicable. Changes in methods are forced by increase in value of land and water; the intensive system taking the place of extensive.

Wild Flooding.

This is the natural and primitive method of applying water to crops. In its simplest form it is nothing more than a diversion of the waters of a stream to the land to be irrigated, leaving the laws of nature in charge without further aid from man. Many native, or wild hay meadows are irrigated in this way with little supervision other than turning on the water in the Spring and turning it off again a week or so before harvest time. The consequence is usually that the meadow is continually under water to a varying depth during the growing season. Only the water-loving or swamp grasses, and the rushes and sedges, survive such treatment. The finer native grasses, as the wheat grasses, are rapidly killed out. As the coarse grasses thrive, and give comparatively good yields, the practice is in places retained, chiefly among stockmen with only incidental interests in farming and

on lands of comparatively small value. As lands increase in value and methods improve, these meadows are reseeded to finer grasses and more care is used in irrigation. If the practice of wild flooding is retained at all, the meadow is left under water for short periods only, of a few hours to a week in duration.

Flooding From Field Ditches.

This is usually known simply as "flooding," and is perhaps the most widely used of all methods, especially in the newer irrigated districts. The ditches are most commonly run parallel to the slope, irrigation taking place from only one side of the ditch and extending to the next ditch. Sometimes on nearly level land the ditches are run down the steepest slope, irrigation taking place from both sides and extending midway between ditches. Under either method the distance between laterals should not be over 200 feet, and it is better to have them closer together. Irrigation is easier and more uniform if the laterals are only 50 to 100 feet apart, though, of course, it is then necessary to have more field ditches, each one of which takes out some crop-growing area from the field. For valuable crops, however, the advantage lies with the closer spacing of the ditches. These field ditches may be either temporary or semi-permanent. With annual crops, such as grains, the common practice is to plow and harrow over them, remaking them each year. This is more convenient, as the drills and other farm implements can then be driven across the field without interference by the ditches. It entails the extra work of listing out and trimming the ditches each year. Permanent ditches should also be repaired and trimmed each year, for if this is not done, they are very apt to become irregular, cut out in places, and stopped up with vegetation in other places. The common lister and the V-shaped crowder or "Go-Devil," are the implements commonly used in making field ditches. The "A," or "Go-Devil," is easy to construct, and can be adjusted to make various widths of ditches. In preparing ground for this kind of irrigation it should be brought to a uniform slope by means of scrapers and home-made levelers, or some other levelling device, as the labor of irrigating each year will depend on how well this has been done. This method is in general suitable for medium slopes, soils which do not bake or crust badly after flooding, grains, meadows and hay crops, and for the extensive system of farming, where lands are not of great value, and such crops as require comparatively little attention are raised. While in first outlay the expense necessary is not large, the annual cost for irrigation is usually excessive. From two to five acres a day is as much as one experienced irrigator can thoroughly water, and as a rule the irrigation is more uneven than with other methods. This causes uneven ripening of the crops, which is, of course, a disadvantage.

The Furrow Method.

There has been a demand for a method of irrigation which does not flood the "crown" of the crop plants, and also one which would not produce baking and cracking of the surface soil, so prevalent with heavy clay soils under the flooding methods. The furrow method accomplishes this. The seepage of water from the side of the small ditch or furrow outward to the crop, or "subbing," is maintained. Various modifications of the furrow methods are used to adapt it to different conditions of soil, crop, or head of water used. For grain drilled in rows eight inches apart it is usual to make the furrows narrow and deep, four to five inches wide, three to four inches deep, and twenty-four to thirty-two inches apart. For alfalfa and other drilled hay crops the practice is much the same; the furrows being perhaps a little larger. The head ditches or laterals between which the furrows are run should not be over 200 feet apart, as a general rule. That is, the furrows should not be so long that the water will not run through from end to end in a reasonable time, say half an hour to an hour. They should be long enough, so the water will have time to "sub," or seep to the side and dampen all the soil between the furrows. The best length will depend on the soil, the slope, the size of, and distance between the furrows. It is determined by the individual farmer for his own conditions without great difficulty.

Root crops are almost always found to do best under the furrow system. Potatoes, especially, show the bad effects of even a break between the furrows, and consequent flooding. In this case the furrows are made quite large, the rows being ridged, and one furrow between each two rows. Sometimes, the best method for the crop and the most economical of water, is to irrigate only alternate furrows, as with sugar beets and potatoes. The land cultivation, thinning, etc., can then be done from the dry rows more conveniently. The furrow system is coming to be widely used for irrigating orchards.

The method of dividing the irrigation streams between a number of small furrows varies in different localities. At Twin Falls, Idaho, and a number of other progressive irrigation districts, what is called the "lath box" system is used. In this system boxes are made by placing four strips of wood, as common plastering laths cut in half, together and nailing them so as to form a narrow, square-section box which may be used as a pipe to admit water through the lateral bank to the upper end of the furrow. The boxes are placed in the ditch banks at each furrow and are easily closed by a stopper formed of a short piece of lath, or by a small square of tin tacked by one corner over the opening. The most common method in all probability is that of depending on the irrigator to open and close the head of the furrows by means of a shovel and some dirt. Some-



The Big Horn River in Wyoming is a Grand Stream.

times a flume or trough, or pipe, is used instead of laterals, and holes at proper distances, easily opened or closed, serve to regulate the flow into the furrows. For valuable land, these methods are proving a success, and when the preparation has been completed, the actual labor of irrigation is reduced to supervision of the flow in furrows, and regulation of the little head gates.

Check Method.

This is simply a modified flooding method by which the water is retained at some depth on the land, as long as the irrigator thinks best, instead of being spread out by hand labor while running, as in flooding. This is accomplished by means of small dikes or levees thrown up, either in rectangular, or square form, or along contour lines. The square system makes the fields take on somewhat the appearance of a gigantic checker-board, whence the name given this method. The check system is best suited to land having very little slope. On practically level ground the banks may be placed far apart. In parts of Arizona and New Mexico on such land they may be as much as a half mile apart, thus inclosing a quarter section in a single "check." But in general the "checks" or squares are very much smaller, often containing less than a quarter acre.

(Continued in October.)

IRRIGATION OF ORCHARDS

BY SAMUEL FORTIER

Chief of Irrigation Investigations, Office of Experiment Stations, U. S. Department of Agriculture.

THE usual way of irrigating orchards is by means of furrows. These vary in depth, length, and distance apart, but this diversity does not tend to create different kinds of furrow irrigation. The division of this subject is rather due to the means employed of distributing water from the supply ditch to the furrows. In some cases the distribution is effected by making openings in an earthen ditch, in others by inserting wooden or iron spouts in the ditch banks, while in many others flumes having the desired number of openings or pipes with standpipes divide the supply among the requisite number of furrows. These designs and methods will be described under their respective headings.

Earthen Head Ditches.

Permanent ditches at the head of orchard tracts should be located by a surveyor. The proper grade depends chiefly on the soil. If the soil is loose and easily eroded, a slow velocity is best. On the other hand, the velocity must be sufficiently rapid to prevent the deposition of silt and the growth of water plants. In ordinary soils, a grade of $2\frac{1}{2}$ inches to 100 feet for a ditch carrying 2 cubic feet per second is not far out of the way. The amount of water to be carried varies from $\frac{1}{2}$ to 2 or more cubic feet per second. A ditch having a bottom width of 24 inches, a depth of 6 inches, and sloping sides, ought to carry $1\frac{1}{2}$ cubic feet per second on a grade of half an inch to the rod or 3 inches to 100 feet. Such a ditch may be built by first plowing four furrows and then removing the loose earth either with shovels or a narrow scraper. The loose earth may likewise be thrown up on the sides and top by means of the homemade implement shown in figure 8. Canvas dams, metal tap-poons, or other similar devices are inserted in the head ditch to raise the surface of water opposite that part of orchard where furrows have been made and which is about to be watered. The chief difficulty in this mode of furrow irrigation arises in withdrawing water from the ditch and in distributing it equally among a large number of furrows. A skilled irrigator may adjust the size and depth of the ditch bank openings so as to secure a somewhat uniform flow in the furrows, but constant attention is required in order to maintain it. If the water is permitted to flow for a short time unattended the distribution is likely to become unequal. Parts of the ditch bank become soft, and, as the water rushes through, the earth is washed away, permitting larger discharges and lowering the general level of the water in the ditch so that other openings may have no discharge. Some of the orchardists of San Diego county, Cal., insert in niches cut in the bank pieces of old grain sacks or tent cloth. The water flows over these without eroding the earth. Another device is to use a board pointed at the lower end

and containing a narrow opening or slot through which the water passes to the furrow. Shingles are also used to regulate the flow in the furrows. The thin ends of these are stuck into the ground at the heads of the furrows.

Short Tubes in Head Ditches.

In recent years short tubes or spouts have been used in many of the head ditches of orchards to divert small quantities of water to furrows. These tubes are usually made of wood, but pipes made of clay, black iron, galvanized iron, and tin are occasionally used.

For nurseries and young trees especially, and also for mature trees, a cheap and serviceable tube may be made from pine lath, such as are used for plastering. The 4-foot lengths are cut into two equal parts and four of these pieces are nailed together to form a tube. One of these tubes when placed with its center 2 inches below the surface of the water in the head ditch discharges nearly three-quarters of a miner's inch of water, and if placed 4 inches below the surface will discharge more than 1 miner's inch. In southern Idaho the lumber mills manufacture a special lath for this purpose. It is $\frac{1}{2}$ inch thick, 2 inches wide, and 36 inches long. If such tubes when thoroughly dry are dipped in hot asphalt they will last a much longer time. In some of the deciduous orchards of California a still larger wooden tube or box is used. Figure 9 represents one of these. It is made of four pieces of $\frac{3}{4}$ by $3\frac{3}{4}$ -inch redwood boards of the desired length. The flow through this tube is regulated by a cheap gate, consisting of a piece of galvanized iron fastened by means of a leather washer and a wire nail.



Fig. 8.—The Use of the "A" Scraper in Building Head Ditches.

The orchardist who lives near a manufacturing town or city can often purchase at a low figure pieces of wornout and discarded piping varying from $\frac{3}{4}$ to 2 inches in diameter. Such pipes when cut into suitable lengths make a good substitute for wooden spouts. Tin tubes one-half inch in diameter and of the proper length have been used with good success. In compact soils, through which water passes very slowly, the furrows must be near together, and under

such conditions small tin tubes are to be preferred.

In making use of tubes of various kinds to distribute water to furrows it is necessary to maintain a constant head in the supply ditch. This is done by inserting checks at regular distances. These distances vary with the grade of the ditch, but 150 feet is not far from being an average spacing. In temporary ditches the canvas dam is perhaps the best check, but in permanent ditches it pays to use wood or concrete. An effective wooden check is shown in figure 10. In this the opening is controlled by a flash-board which may be adjusted so as to hold the water at any desired height and at the same time permit the surplus to flow over the top to feed the next lower set of furrows.

Head Flumes.

Formerly head flumes for orchards were built of wood, but the steady increase in the price of lumber and the decrease in the price of Portland cement have induced many fruit growers to use cement instead. When built of wood, the length of the sections varies from 12 to 20 feet, 16 feet being the most common. The bottom width runs from 6 to 12 inches, while the depth is usually 1 to 2 inches less. Redwood lumber $1\frac{1}{4}$ inches thick is perhaps the best for the bottom and sides, and joists of 2 by 4-inch pipe or fir are commonly used for yokes which are spaced 4 feet centers. Midway between the yokes auger holes are bored and the flow through these openings is controlled in the manner shown in figures 11 and 12. A 2-inch

fall for each hundred feet may be regarded as a suitable grade for head flumes, but it often happens that the slope of the land is much greater than this, in which case low checks are placed in the bottom of the flume at each opening, as shown in figure 12.

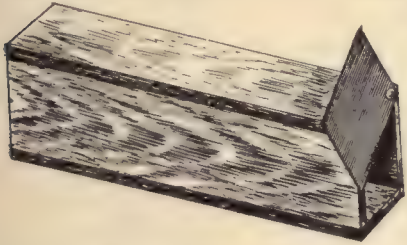


Fig. 9.—Wooden Box Placed in Bank of Head Ditch.

A head flume composed of cement, sand, and gravel costs as a rule about twice as much as a wooden flume of the same capacity, but the early decay of wood, especially if it comes in contact with earth, makes the cement flume cheaper in the end. By means of a specially designed machine, which is patented, cement mortar composed of one part cement to about six parts of coarse sand is fed into a hopper and forced by lever pressure into a set of guide plates of the form of the flume. Such flumes are made in place in one continuous line across the upper margin of the orchard tract. After the flume is built and before the mortar has become hard, small tubes from $\frac{3}{4}$ to $1\frac{1}{2}$ inches in diameter, the size depending somewhat on the size of the flume, are inserted in the side next the orchard. The flow through these tubes is regulated by zinc slides shown in figure 12. Flumes of this kind are made in five sizes, the smallest being 6 inches on the bottom in the clear and the largest 14 inches.

At a slightly greater cost a stronger flume can be built by the use of molds. The increased strength is derived from a change in the mixture. In the machine-made flume the mixtures of one part cement to five or six parts of sand is lacking in strength, for the reason that there is not enough cement to fill all the open spaces in the sand. In using molds medium-sized gravel can be

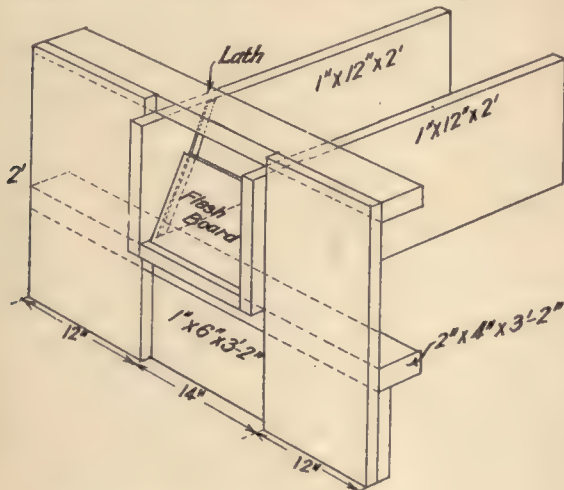


Fig. 10.—Wooden Check in Head Ditch.

added to the sand and the mixture resembles that of the common rich concrete. Such flumes can be built of almost any size from a bottom width of 10 inches to one of 40 inches, and from a depth of 8 inches to one of 24

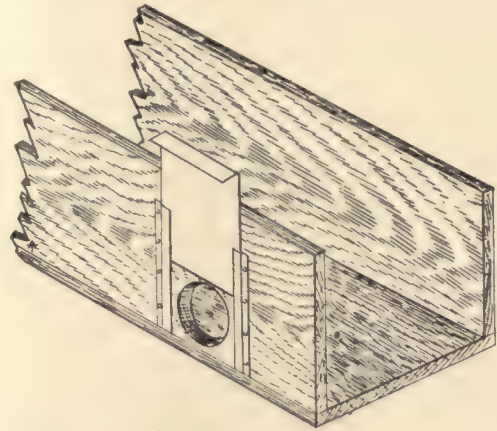


Fig. 11.—Section of Wooden Head Flume, Showing Opening and Gate.

be about \$9 per cubic yard for the larger flumes and \$10.50 for the smaller sizes. The quantity of concrete required per linear foot of flume depends on its size and the thickness of its sides and bottom. The dimensions given in figure 13 are for light rather than for heavy flumes and are designed for localities where there is little frost.

For large head flumes and laterals, many fruit growers first carefully prepare an earthen ditch which has carried water for at least one season and afterwards line the inner surface with cement concrete. Figure 14 shows a section of such a ditch.

Several years ago 3,200 linear feet of head ditches were lined for 26½ cents per foot; they were 14 inches on the bottom with 18-inch sides and a 2-inch lining. The cement cost \$2.85 per barrel, gravel 75 cents per yard, and labor \$1.75 to \$2.50 per day.

Pipes and Standpipes.

Head flumes, being placed on the surface of the ground, interfere with the free passage of teams in

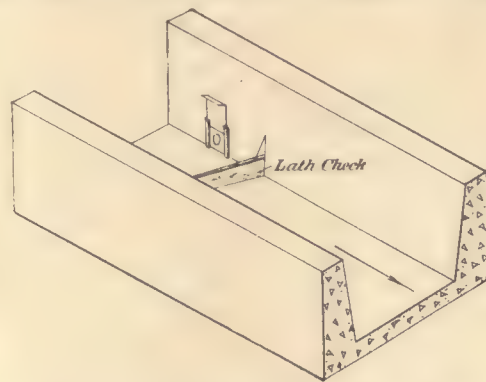


Fig. 12.—The Use of Low Check in Head Flume.

cultivating, irrigating, and harvesting the crop. Dead leaves from shade and fruit trees also clog the small openings in the flumes. These and other objections to flumes have induced many fruit growers of southern California to convey the water in underground pipes and distribute it through standpipes placed at the heads of the rows of trees. Both cement and clay pipes are used for this purpose.

The former are usually molded in 2-foot lengths, with beveled lap joints, and consist of a 1 to 3 or 1 to 4 mixture of cement and fine gravel and sand. The most common sizes are 6, 8, 10 and 12 inches in diameter, having a thickness of shell in the 12-inch pipe of $1\frac{1}{2}$ inches which is reduced to a trifle more than 1 inch in the 6-inch pipe. Piping of this kind, when well made and carefully laid, will withstand a head of 10 to 16 feet. The

clay pipe is similar to that used in cities for sewers and, having stronger joints, withstands a greater pressure but costs more.

A line of pipe is laid about 2 feet below the surface from the feed main and measuring box across the top of the orchard, and as each row of trees is passed a standpipe is inserted. The general plan is shown in outline in figure 15. Various devices are employed to convey the water from the pipe to the surface of the ground at the head of each tree row and divide it up evenly among 4 to 6 furrows. One of the most common consists of a series of standpipes, the top of each set rising to the same elevation. At each change of elevation special standpipes are used and in these are inserted gates provided with overflows. The manner of distributing the water from a standpipe to the furrows of any one row is shown in figure 16.

Occasionally a high-pressure pipe is substituted for cement and clay. This is tapped at the head and in line with each row of trees, and a small galvanized-iron pipe is inserted. These standpipes are capped by an ordinary valve which regulates the flow to each row of trees. This method is shown in operation in figure 17, where a young orchard is being irrigated from $\frac{3}{4}$ -inch galvanized-iron standpipes connected to a 3-inch wooden pipe.

Making Furrows.

The length of the furrow is often governed by the size of the orchard. The rows of citrus trees seldom exceed 40 rods in length, but the apple orchards of the Northwest are larger as a rule. Even in large tracts it

sinks readily through it, short furrows should be used, otherwise much water is lost in deep percolation on the upper part of the tract. Prof. H. Culbertson, of San

Diego County, Cal., after a careful investigation of this subject has reached the conclusion that on sandy or gravelly soil having a steep slope the proper length of furrows is 200 feet, while on heavier soils and flatter slopes the length may be increased to 600 feet.

The grade of furrows varies quite widely. In flat valleys it is often not possible to obtain a fall greater than 1 inch to 100 feet, while on steep slopes the fall may reach 20 inches per 100 feet. On ordinary soils a grade of 3 to 4 inches is to be preferred, and where the fall exceeds 8 to 10 inches to 100 feet the trees should be set out in such a way as to decrease the slope of the furrows.

The number of furrows in orchards depends on the age of the trees, the space between the rows, the depth of furrow, and the character of the soil. Nursery stock is irrigated by one or two furrows and young trees by two to four. A common spacing for shallow furrows is $2\frac{1}{2}$ feet, while deeper furrows are made 3 to 4 feet apart. The general trend of orchard practice is toward deep rather than shallow furrows, a depth of 8

inches being frequently used.

The furrowing implement most commonly used by the orchardists of Orange County, Cal., consists of a sulky frame to which are attached two or three double moldboard plows. Those who prefer a small number of deep furrows use a 12 to 14-inch corn lister. In figure 18 is shown a furrower made by attaching an arm to a

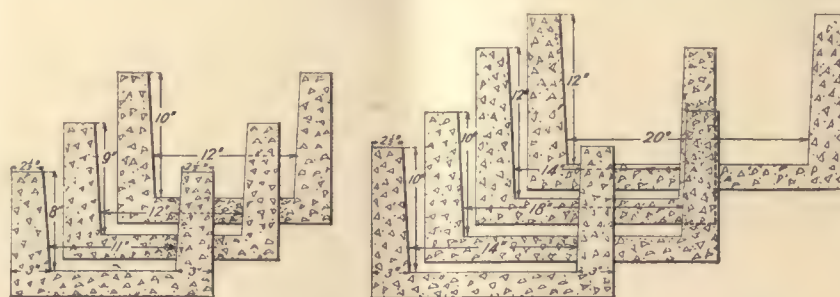


Fig. 13.—Common Sizes of Concrete Head Flumes.

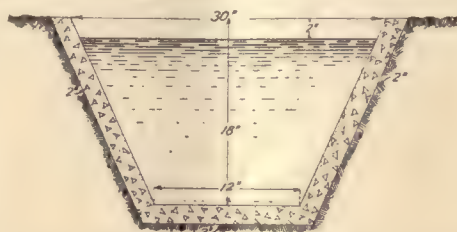


Fig. 14.—Earthen Head Ditch Lined with Concrete.

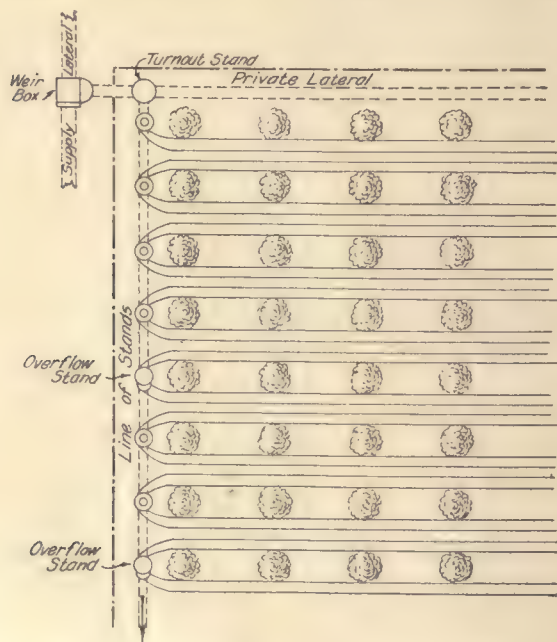


Fig. 15.—The Use of Pipes in Furrow Irrigation.

is doubtful if it ever pays to run water in furrows more than about 600 feet. Where the soil is open and water

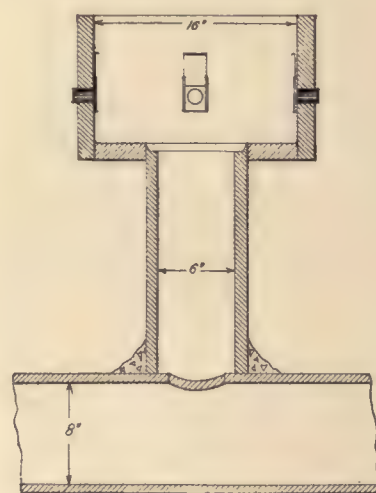


Fig. 16.—Section of Standpipe Outlined in Figure 15.

cultivator and then fastening two shovels to the arm. In the view the space between the furrows is $4\frac{1}{2}$ feet and the depth is regulated by the lever arm of the cultivator.

(Continued in October issue.)

PITTSBURGH LAND SHOW TO BOOM IRRIGATED LANDS.

By Mary J. Tierney.

Irrigation will receive another boom by the National Land and Irrigation Exposition to be held at Pittsburgh, October 17 to 29, and the stimulus that will be given to the sale of irrigated lands will, no doubt, arouse the interest of all students of irrigation, and those connected with the various reclamation enterprises, throughout the country. The Pittsburgh Land Show will be held at the Duquesne Gardens, which is said to be the largest building of its kind in the world, and which is an ideal site for expositions of this kind, being happily situated upon street car lines with perfect transportation facilities to all parts.

The building is installed with its own electric lighting plant, so that direct and alternating currents will be at the disposal of the exhibitor. The building will be gorgeously decorated and illuminated, and an excellent variety of exhibits from all parts of the country have been arranged for. The United States government are sending an exhibit and government lecturers will explain the present conditions, and will give illustrated lectures on irrigation, forestry, scientific agriculture and its kindred subjects.

The Agricultural State Board of Pennsylvania and of other states will also be represented with exhibits, as will a number of agricultural colleges and universities, chambers of commerce, and boards of trade from various parts of the country. Among the railroads which have already contracted for space are the Union Pacific, the Cotton Belt, the Southern and the Iron Mountain, while reservations have been made by several other roads. The exhibits will include the usual pictures of farm life and models, while enormous quantities of grains, fruits and vegetables will also be on exhibition.

The Alabama and Sumatra Tobacco Company are preparing an exhibit of more than usual interest and will show the wonderful progress that has been made in the cultivation of Sumatra wrapper leaf in the United States and will have samples of all kinds of tobaccos on hand. The Pittsburgh Land Show is being held under the auspices of the Pittsburgh Gazette Times and Pittsburgh *Chronicle*, the two oldest and most influential newspapers in the community, and has on its executive staff several of the most experienced and best known exposition builders in the country.

Irrigation will be well taken care of and a large section has been set aside for the exhibition of models, pictures and other subjects pertaining to irrigation and drainage.

There is no better location in the country for a land show than Pittsburgh and an enormous attendance is being looked for. The section is one of prosperity and the people are thrifty and have money to invest. Hundreds of rolling mill workers, who earn large salaries, are in the market for farm lands, and owing to the nature of their work are unable to follow their occupation for any number of years, and as they are well paid, they are usually, after a few years of labor, in a position to buy a farm of more or less magnitude. To these people, the Land Show will be of especial interest and it will give them an opportunity of learning something about farm lands and opportunities in the more distant sections of the country and to teach them something about the wonderful results of irrigation in the vast tracts of western country of which they know but little. The Pittsburgh papers have been running stories of land show interest for several months, and a strong enthusiasm has been worked up among the people of the surrounding country.

Newspaper stories have been sent out to all of the farm and agricultural journals, trade magazines and principal daily newspapers all over the country, while all of the smaller papers contiguous to Pittsburgh have entered into the spirit of the show with most encouraging co-operation, and have devoted columns of space to the coming Exposition. The publicity department has also been active, and the country is covered with artistic pictorial posters for miles around. Colored lithographs and type billing-matter decorates the windows of most of the local stores and tack cards and banners are plentifully distributed along the country roads which lead to the

innumerable suburban cities. The National Land & Irrigation Exposition, which will be popularly known as Pittsburgh's big land show, will undoubtedly be one of the most complete exhibitions of its kind ever held in this country, and its value as a means of education cannot be overestimated. Apart from its interest as an exhibition of earth products it will convey to the farmer the homeseeker and investor knowledge of priceless value, and will stimulate the "Back to the Soil" crusade in a manner which could never be arrived at by any other means.

The space room is practically all gone, there being but a few spaces left to dispose of. It would be well for those wishing to secure further information to write to the National Land & Irrigation Exposition at their offices in the Keystone building, Pittsburgh, Pa., addressing their inquiries to Francis C. McCarty, Director of Administration, or to Sydney Wire, Director of Publicity.

THE FOUNTAIN VALLEY, COLORADO.

Peach orchards in Colorado, through irrigation, have been made to produce returns sufficient to increase the value from \$25 to \$50 per acre to as high as \$2,500 to \$4,000 per acre. Under irrigation peaches bring a profit of from \$150 to \$250 per acre; pears \$200 to \$300 per acre per season, and apples have been known to produce as high as \$1,000 per acre.

It is rather difficult to convince an easterner that land can be made to produce this much in the way of earning in one year, but many of the eastern people who are going on from Chicago and the central states points to the Irrigation Congress will have an opportunity of seeing Colorado and learning definitely, as eye-witnesses, the facts above stated.

It is expected that the Fountain Valley, which extends from Colorado Springs to Pueblo, will be visited by many of the delegates to the Congress, as well as the visitors. The opportunity will then be given them to see the land of the Fountain Valley Land and Irrigation Company, which extends from about 3½ miles southeast of Colorado Springs to one mile south of Fountain, a distance of about twelve miles. This tract includes the bottom and mesa lands on the north and east side of Fountain river. The reservoirs and much of the finest of the land cannot be seen from the railroads or wagon roads, and one can get no fair conception of the magnitude of this irrigation system or the quality and extent of the lands without inspecting them at close range.

The Fountain Valley Land and Irrigation Company expect to be in position to entertain those who may stop off at Fountain and Colorado Springs, and no doubt facilities for transportation in the form of automobiles, etc., will be placed at the disposal of visitors and prospective buyers.

There are lying untitled in the state of Colorado today, a million or more acres of land which could be made exceedingly valuable by the application of water. It will take some years, however, for proper systems to be developed which will bring this land all under cultivation.

In a recent interview Governor Shafroth stated that it will take 30,000 additional farms to supply Colorado's cash market, which is considered one of the best markets in the world, owing to the fact that a large per cent of the produce in the state is disposed of to mining camps where good prices in cash are always paid. Governor Shafroth also states that Colorado has room for several hundred thousand farmers who will be able to supply the markets of neighboring states or of the far East. This can only be done when the land now lying uncultivated is put under water and properly developed. Colorado is also a great state for stock growers and it should be particularly good for swine growers and feeders. It is an ideal state for poultry raising and some of the settlers who have made a specialty of poultry have done well; in fact, have made money. This is particularly true of some of the settlers on the Fountain tract.

Those who stop at Fountain should not fail to go eastwardly from there to the higher mesas and get a view of the mountain range which takes in Pike's Peak, Cheyenne mountain, the Sangre de Cristo range, and, on

(Continued on page 564.)

PENROSE AND BEAVER PARK, COLORADO.

IRRIGATION is conceded to be one of the most potent factors in the up-building and development of the west today, but the system in operation in the new fruit district of Beaver Park, surrounding the thriving young town of Penrose, is the most unique of them all. In a state noted for its vast opportunities and rapid development, very few of its projects have forged to the front more quickly than that of Beaver Park and few indeed of its enterprises have had more substantial backing or a more flattering beginning.

For the benefit of those unacquainted with the state, I will say that Beaver Park is located in the eastern part of Fremont County, eleven miles east of Canon City and seven miles northeast of Florence. Exactly two years ago it was in the arid land class. However, by the determination, perseverance and sagacity of its backers, together with the unlimited expenditure of capital, in two short years it has taken its place as one of the most promising and prosperous communities of the state. They have one or two bearing orchards on Beaver Park and one of these took the first prize at the Colorado State Fair last fall for "The Best Box of Winter Apples," in competition with the rest of the state. Already hundreds of young orchards have been started, while on every hand growing crops of various kinds are to be seen, houses are springing up and homes

gates constructed for the purpose, the fall of the land being about 100 feet to the mile, thus enough pressure is obtained to force the water to flow out of the head-gates. There are 500 of these headgates.

The Beaver Land and Irrigation Company is behind the Beaver Park project, and the company is composed of some of Colorado's most progressive and influential business men. They have an Improvement Department, with a competent man in charge, whereby it is possible for a non-resident land owner to grow an orchard without residing in the state, if he so desires, and it will have just as good care as though he were looking after it himself. The Manager of the Improvement Department will have the ground plowed, fenced, trees planted, pruned, irrigated and cultivated at actual cost to the owner. Beaver Park is divided up into ten-acre tracts, with a 50-foot street around every forty acres.

The company is now constructing a large reservoir, with a capacity of 5,000 acre feet, which will be completed in a very short time; in fact, they are now storing water in it. In this work they are using three trains of narrow-gauge dump cars, running night and day, and which are filled by steam shovel. When completed, this reservoir alone will hold enough water to supply Beaver Park, without the additional supply of Beaver Creek and the rain fall. Upon its completion it will be stocked with trout and will be noted for its attractive features as a summer resort, being located practically in the mountains.

One year ago the Beaver, Penrose and Northern Railway was completed and the new town of Penrose



Schaeffer Dam, Under Construction, May 25th, 1910, Lake MacNeill, 85 Feet Deep, Will Be 90 Feet Deep When Completed.

being prepared—in fact, everywhere you see the hustle and bustle characteristic of the building of a new empire. I know of no place which offers more opportunities or greater possibilities.

Beaver Park has the most complete and up-to-date irrigation system in the west today, the water being conducted onto the land entirely through pipe lines. The main pipe line is constructed of Oregon fir lumber two inches in thickness, with five-eighths-inch steel bands every four to six inches. This pipe line is 14,000 feet long, 42 inches in diameter and has a capacity of 78 cubic feet of water per second of time. From this pipe line the water runs through a tunnel 1,000 feet long, which is cemented side, top and bottom. From the tunnel the water goes into the main ditch. The cross laterals, conducting the water onto each ten-acre tract, are made of cement piping from 8 to 24 inches in diameter, laid 18 inches underneath the ground, which prevents seepage, evaporation, breakage of ditches, scattering of weed seed, etc., besides keeping the water pure and cool. In fact this system is like a big city water works, only on a much larger scale. The water is the same as is used by the city of Colorado Springs, which is noted for the finest water in the world, coming directly from Pike's Peak, and is the purest of mountain snow. Another advantage of this system is that you can plow right over the ditches and they do not cut up the land. The water is brought to the top of the ground through cement head-

started. In this short time a good-sized little town has sprung up, with a general store, two lumber yards, two restaurants, blacksmith shop, barber shop and pool hall, drug store, hardware store, meat market, carpenter shop, hotel, garage, livery stable, church, depot, school house and a newspaper. The general offices of the Beaver Land and Irrigation Company are also located there. The new town of Penrose is fast showing the effect of the land improvement around it, by the wonderful strides made in the past year, and nothing can prevent its being a city of 5,000 inhabitants in five years' time.

It would pay anyone contemplating a trip to Colorado to visit Penrose and Beaver Park to see this up-to-date irrigation system and to note the wonderful progress and development of this new section of Colorado.

The passenger department of the Union Pacific Railway has issued a very elaborate and finely illustrated folder concerning the Eighteenth National Irrigation Congress which will be held in Pueblo, Colorado, September 26th to 30th, 1910.

The illustrations include a map of the city of Pueblo, showing the location of the Mineral Palace in which the Congress is to be held, also the location of the National Irrigation Exposition, principal hotels, railway stations, etc. Among the illustrations are shown a general view of the city of Pueblo, its public library, post office, club buildings, school buildings, etc.

The Union Pacific System will, no doubt, carry large numbers to and from the Congress from eastern points as well as from all of the Pacific coast and intermountain country.

A copy of this folder may be secured by addressing Gerrit Fort, Passenger Traffic Manager, Omaha, Nebraska, or W. G. Neimyer, General Agent, Chicago, Illinois.

Supreme Court Decisions

Irrigation Cases

NECESSITY OF OWNERSHIP OF LAND.

A person seeking to claim water for irrigation purposes by appropriation must own the land sought to be irrigated, or must have a possessory interest therein. *Avery v. Johnson*. Supreme Court of Washington. 109 Pacific 1028.

DIVERSION OF WATER.

When a riparian owner gives permission, even gratuitously, to divert water from the stream, he cannot recover damages for such diversion, made before revocation of the permission. *Merritt v. Houlton Water Co.* Supreme Judicial Court of Maine. 76 Atlantic 951.

SUIT BARRED AFTER FIVE YEARS.

That certain artesian wells in a water course were left uncapped, in violation of St. 1877-78, p. 195, c. 153, did not constitute a special injury to plaintiff entitled to water from the stream, where the water from the wells did not go to waste during the irrigation season. *Hudson v. Dailey*. Supreme Court of California. 105 Pacific 748.

RIGHT TO DIVERT.

The owner of land through which flows a running stream of water in a well-defined channel has a right to divert the stream from the channel upon his own land, provided he returns it unimpaired to the channel upon his own land. *Johnston v. Hyre*. Supreme Court of Kansas. 109 Pacific 1075.

EFFECT OF NOTICE OF APPROPRIATION.

The filing of notice of appropriation of waters merely shows an intent to appropriate, and does not establish an appropriation nor determine the time or amount thereof; the necessity for the use, actual diversion, and use being essentials to the acquisition of title. *Ison v. Sturgill*. Supreme Court of Oregon. 109 Pacific 579.

IRRIGATION CANALS.

It was no defense to a suit by a reservoir company, to enjoin interference with its water flowing in the canal of an irrigation company, that there was a large volume of water in the source of supply, available under the irrigation company's appropriations. *Hackett v. Larimer & Weld Reservoir Co.* Supreme Court of Colorado. 109 Pacific 965.

CONVEYANCES.

A grantee's acceptance of a deed containing a reservation to the grantor of a priority or appropriation of water for a certain reservoir, when no priority or appropriation had been secured, did not estop the grantee to claim an appropriation of its own for such reservoir. *Windsor Reservoir & Canal Co. v. Lake Supply Ditch Co.* Supreme Court of Colorado. 98 Pacific 729.

DIVERSION.

Other appropriators of waters of the creek above the lands of the parties need not be made parties to an action to determine whether defendants shall be enjoined from wrongfully diverting waters to the damage of plaintiffs. *Peck v. Bono*. Supreme Court of Washington. 110 Pacific 13.

TRANSFER OF UNUSED WATER.

The owner of a mill race, entitled to appropriate a certain quantity of water has no right to transfer to another any portion of such quantity not actually used to operate the mill, as against appropriators prior in right to the transferee. *Windsor Reservoir & Canal Co. v. Hoffman Milling Co.* Supreme Court of Colorado. 109 Pacific 422.

RIGHTS OF PARTIES.

One entitled by grant to use an irrigation ditch to convey waters in excess of the amount required for the use of the grantor has no right to commit an act occasioning injury to the grantor, and the latter need not see that sufficient water is flowing in the ditch to supply the needs of the grantee. *Carnes v. Dalton*. Supreme Court of Oregon. 110 Pacific 170.

PERMITTING EXPENDITURES.

A riparian owner who knowingly stands by while a public service corporation constructs and completes at great expense

a system of works designed for public use is estopped from invoking the aid of equity to restrain the diversion of water necessary for the works, and his remedy is at law for damages. *Miller & Lux v. Madera Canal & Irrigation Co.* Supreme Court of California. 99 Pacific 502.

RIGHTS OF PARTIES.

The fact that a co-owner of an irrigation ditch with the contract right to appropriate a certain quantity of water from the ditch elected to take less than such quantity did not justify a complaint by one to whom the owners had granted the right to use the ditch to convey waters in excess of the quantity to which the owners were entitled. *Carnes v. Dalton*. Supreme Court of Oregon. 110 Pacific 170.

PARTIES TO SUIT.

Under the rule that those having no interest in the subject-matter are not proper parties, an irrigation company was not a necessary party to a suit by a reservoir company to enjoin interference with its water, flowing in a canal of the irrigation company, where the issue was whether plaintiffs or defendants owned the water. *Hackett v. Larimer & Weld Reservoir Co.* Supreme Court of Colorado. 109 Pacific 965.

INJURIES FROM OVERFLOW.

Mills' Ann. St. § 2272, making the owners of reservoirs liable for all damages from leakage or overflow of the waters or by floods caused by breaking of the embankments was not impliedly repealed by Laws 1899, c. 126, entitled "An act in relation to reservoirs," as the latter act expressly relates only to reservoirs of a certain capacity and dams having certain dimensions. *Garnet Ditch & Reservoir Co. v. Sampson*. Supreme Court of Colorado. 110 Pacific 79.

ORGANIZATION OF IRRIGATION DISTRICTS.

"The holders of title or evidence of title," or entrymen "on lands under any law of the United States or of this state," who have received receipts or other evidence of their rights as such entrymen, are competent and proper persons to sign a petition for the organization of an irrigation district under the provisions of section 2372, Rev. Codes, and such petitioners may be counted in computing the requisite number of signers or holders of title or evidence of title to lands susceptible of irrigation under a common system of irrigation. *Gem Irr. Dist. v. Johnson*. Supreme Court of Idaho. 109 Pacific 845.

CONVEYANCE OF WATER RIGHTS.

Plaintiff sold defendant land, together with a half interest in an irrigation ditch which conducted water to the land, and the contract provided that in case defendant should not be satisfied with the ditch plaintiff would transfer to him a share in a water company in lieu of the interest in the ditch. Defendant improved the ditch, and obtained an additional supply of water, but thereafter became dissatisfied, and, as a compromise, a certain amount was deducted from the purchase price in lieu of the ditch and water right. Held, that all improvements of the ditch and the supply of water secured thereby reverted to plaintiff. *McElravy v. Brooks*. Supreme Court of Colorado. 109 Pacific 863.

NECESSITY OF BONA FIDE SETTLEMENT.

The appropriation of the waters of a stream for irrigation purposes by one occupying public lands could confer no right on such occupant prior to his assumption of the status of an actual bona fide settler under the homestead laws, and the absence of a bona fide intention to settle on the land is sufficiently evidenced by the act of the occupant in failing for nearly two years, and while the land had been surveyed and was open to entry, to file in the land office a relinquishment received by him from a prior trespasser. *Avery v. Johnson*. Supreme Court of Washington. 109 Pacific 1028.

RIGHT TO DITCH LAND.

A landowner has a right to dig a ditch upon his own land along and adjoining the land of another, so long as the effect thereof is such as not to interfere with the lateral support of his neighbor's land; but if the lateral support of his neighbor's land is removed, and damage results therefrom, without fault on the part of the neighbor, he is responsible therefor; but if the neighbor by any act, or acts, assembles quantities of water and casts them into the ditch in such manner as to increase the injury to his own land, and the amount of injury done by each is not apportionable, he cannot recover. *Johnston v. Hyre*. Supreme Court of Kansas. 109 Pacific 1075.

NEW MEXICO'S GREAT NATURAL RESERVOIRS

More Valuable than All the Minerals in the Mountains Rushing to Waste to Gulf of Mexico

COL. R. E. TWITCHELL

First Vice President, Eighteenth National Irrigation Congress.

IN all its history New Mexico has never had so much attention as at the present time. The early admission of the territory as a state, the great land hunger epidemic which seems to be prevalent in the middle and eastern states, the knowledge that in New Mexico there are thousands of acres of land which may be taken up under the homestead laws of the nation, and the great amount of publicity given to the possibilities for the homeseeker and the homemaker in the west and southwest, have provoked an enormous inquiry from all portions of the country.

New Mexico, is looking forward to a great era of prosperity. Of course, locally, the subject just now up-

the dominant party—the Republican—in New Mexico. There are a great many Democrats who believe they have better than a fighting chance.

Even in the west there seems to be a great lack of information as to the prospects of the new state along agricultural lines. The amount of water which may be made available for irrigation purposes, through storage, is but poorly appreciated even among our own people. The truth is the great majority knows nothing about surface and torrential flows, although they witness every year the going to waste of enough water to quadruple the present irrigated area of New Mexico.

The continuation of the Sangre de Christo range of



The Eagle's Nest project comprises several good storage and distributing reservoirs where water can be stored at a very reasonable expense. The best example is a lake fed by many clear mountain streams and was formed by a granite dyke through which the Cimarron River has cut its rocky channel. Had not this been completed among the earlier reclamation projects. The engineering problem of the dam is very simple. A dam 90 feet long on the bottom, 320 feet long on top and 140 feet high, built of rock from the cliffs, will hold 114,000-acre feet of water at one filling. Eagle's Nest reservoir will be at an altitude of 8,100 feet, where there is little evaporation. There will be no loss from seepage on account of the solid granite.

permost in the minds of the people is making the constitution for the new state, and for the next twelve months we will have about as much politics in New Mexico as is ordinarily allotted to the citizen of the great and growing southwest. We are not lacking in politicians; we could loan Colorado a few to great advantage, just now most of them are candidates for the senate. A desire to represent the new state in the upper house of the national Congress is not confined to the members of

mountains from Colorado southward into New Mexico carries their elevation, practically undiminished, down through the western portions of Colfax, Mora and San Miguel counties, and the eastern portion of Taos county, and end in the Glorieta and Santa Fe ranges. This range is a great watershed. Its abrupt and precipitous slopes make a runoff of probably more than one-half of the heavy, dashing rains, and at least one-fourth of the lighter rains and snows, while the forests of pine, spruce and

aspen and other luxuriant vegetation evidence about the same annual precipitation as occurs along the same range up here in Colorado. The many streams flowing out of these mountains towards the east and southwest are the head waters of the Canadian and Pecos rivers. These streams, on reaching the more level valleys below the foothills, except when swollen by waters from melting snows or heavy rains, are usually as quiet and placid as a meadow brook.

At such times, to the unreflective and uninformed, they would seem to drain a territory of scant water supply, and the appellation given them as rivers never fail to excite a smile from the eastern tourist.

Abundant Flood Water.

One only has to look at the width of the stream beds, often 100 or 200 feet from bank to bank; the debris from floods left on the prairies far beyond the banks of the streams; the uprooting and lodgment of large trees; the rolling of huge boulders of 50 to 80 tons weight down the canons, and the data available in the records of the engineering department of any railway company in New Mexico, in order to fully appreciate the volume and violence of the waters contained in the elemental deluges of

hours. I know of one measurement in Logan, New Mexico, on the Canadian river in 1909, which showed that the river carried 100,000 cubic feet per second and most of it came from flood in the Cimarron, Vermejo, and Red rivers in Colfax county. For ages, these waters, more valuable than all the minerals in the mountains upon which they fall, have rushed on to utter waste to the Gulf of Mexico.

Lying to the eastward of this range, beginning just below the Evergreen foothills and extending to the eastern limits of Colfax, Mora and San Miguel counties, are vast stretches of valley, prairie and mesa lands of such gradient and conformation as to be adapted perfectly to artificial application of these waters.

Its Great Natural Reservoirs.

Scattered over this entire scope of country, as well as in the higher levels of the mountains and foothills, are natural depressions and lakes, which, at small expense, can be utilized as reservoirs; while, in the upper levels, nearer the sources of the streams, are many favorable sites where large reserve reservoirs can be constructed at reasonable cost.

Farmers have learned that the best water right is the one with a reservoir behind it. In most irrigation sys-



these will be the Eagle's Nest at the upper end of the Cimarron Canyon. The mountain park or valley opening out above Eagle's Nest Rock was, once a large water covered by this great project been mostly owned by private persons, and if it had been under government control, there is no doubt it would have been either side, with a core of re-enforced concrete anchored into the solid granite on bottom and sides, will form a reservoir covering 2,850 acres and impounding and the mountain streams emptying into it carry very little silt. The immense drainage area and large number of streams above this site insure an ample sup-

the hills. Travelers and drovers compelled to camp for several days beside any one of these streams waiting for the turbulent waters to subside so they can cross, fully recognize the enormous quantity of flood water wasted from the watershed. While they are permanent streams in the sense that they always carry some water, they are, near their source, torrential in character. Often one of these streams carries a volume of water from 15,000 to 20,000 cubic feet per second for twelve to twenty-four

tems which have not sufficient storage capacity, the streams are naturally short of water in the driest part of the season when the farmers need the water most. The soil and subsoil of this whole district are quite uniform in character and favorable to the highest duty of water. The soil is mostly a deep, rich, chocolate-colored sandy loam, with clay subsoil which holds the water where it is most available for plant growth. This feature in connection with the fact that the principal rainfall occurs during July and August renders the duty of water extraordinarily high.

Annual Precipitation is Sufficient.

Vernon L. Sullivan, territorial engineer, has expressed the opinion that in this portion of New Mexico, nine inches of water, properly used, in addition to the natural rainfall, will be sufficient on an average farm. On inquiry of the farmers near Maxwell City, Springer and Las Vegas, I have been assured that this estimate is ample. As a matter of fact, irrigation here may be regarded as supplementary to the natural rainfall. The government records of precipitation over the prairie and mesa portion of this area show a great deal more rainfall than most so-called dry-farming sections have, with the precipitation better distributed over the growing season.

The precipitation at Raton, during 1909, was 23.02 inches, of which 17.31 inches occurred in May, June, July, August and September.

No records have been kept of precipitation on the mountain watershed mentioned, but it is much greater than for the lower elevations.

From such measurements of runoff as have been made from the annual estimated precipitation, and from evidence on the ground of floods in the streams, there can be no doubt that this mountain watershed of many thousand square miles will furnish water to irrigate several hundred thousand acres of land in each of the counties I have mentioned.

The government figures for the runoff from the entire drainage area of the Rio Grande in Colorado are 500 acre feet for each square mile of surface, or a runoff of nine inches per annum. Estimating the runoff from the mountain and foothill area of Colfax county at only six inches at altitudes of 7,000 and 13,000 feet gives 1,010,000 acre feet of water available for irrigating the 512,000 acres of irrigable land, or nearly two acre feet for each acre. The average rainfall being about seven to eighteen inches, this would make a total water supply of forty-nine inches per annum.

Theoretically, it is possible to store and utilize nearly all of this runoff. Practically it is easily possible to store and utilize more and more of it each year, until, with the increased flow of the springs, the raising of the ground water and the increased humidity of the air, caused by irrigation of large areas, all the farming land of this entire district can be brought under the highest state of cultivation.

What Storage Means in Development.

What this means to New Mexico may be realized by seeing the wonderful results of irrigation in certain districts of Colorado, which only a few years ago were treeless plains used only for grazing purposes. Now they are occupied by a numerous population of prosperous farmers, with a sugar mill every few miles and lands selling at \$300 to \$400 per acre, or fruit districts where land is worth from \$1,000 to \$4,000 per acre, having full bearing orchards.

The native people and settlers of Colfax, Mora, San Miguel and Taos counties have successfully grown certain crops—such as wheat, beans, short season corn, sorghum and Kaffir corn, without irrigation, for over fifty years, and the Mexican people have always planted temporal crops above the irrigated lands.

Irrigation farming has been carried on in some parts of Mora, San Miguel and Taos counties since the earliest occupation by the Spaniards while there are remains of ancient irrigation ditches in Taos county used probably many hundred years before by the Pueblo Indians or by some race which preceded them.

In Colfax county which was formerly the home and favorite hunting ground of the Ute and Apache Indians, irrigation farming has been practiced for over fifty years. The noted scout and Indian fighter, Kit Carson, had a ranch on the Ponil near Cimarron and constructed one of the first irrigating ditches in Colfax county. The irrigated farms and the large stone flour mill at Cimarron, owned by Lucien B. Maxwell, supplied the settlers and the United States army posts with flour in the early sixties.

Irrigation Development Just Beginning.

Here B. F. Eaton, the pioneer of the great Greeley irrigation district, afterwards governor of Colorado, learned to farm by irrigation on one of Maxwell's ranches near Cimarron.

But the methods of irrigation, seeding and cultivation were crude and wasteful compared to modern methods now in use in the irrigation districts in California, Utah

and Colorado, and until quite recently no efforts have been made to store and utilize the vast quantities of flood water.

It is only within a few years that the great irrigation possibilities along this watershed have been given any attention. The reason for this is that the greater part of the land in these counties was included in land grants owned by a few individuals and companies and used for grazing purposes. The owners did not want to divide the land into small tracts for settlers. In fact settlers were just what they did not desire. But the settler has come. This means that there will soon be a cultivated farm on the area of ground formerly required for the maintenance of a single steer.

The crops grown under irrigation in this district are chiefly alfalfa, sugar beets, wheat, oats, barley, beans, peas, corn, timothy and orchard grass, Kentucky bluegrass and all kinds of garden vegetables, including melons.

It is a fine fruit country, particularly for high priced apples and pears. The apples are thin-skinned, crisp and juicy, of finest flavor and keeping qualities. There are a few good orchards that have been bearing for 35 to 50 years, with very few failures during that time.

Favorable for Sugar Beet Production.

All the conditions are exceptionally favorable for sugar beet culture under irrigation. The temperature of the summer months, the mean for June, July and August being 70 degrees, followed by a long period of cool dry weather, for ripening and harvesting, are ideal for production of a high tonnage and sugar percentage.

For the past two years sugar beets have been raised near Las Vegas, Watrous, Shoemaker, Miami, Springer and Maxwell, at the last named place in both an experimental and a commercial way. The average sugar percentage of the 1908 crop of New Mexico exceeded that of any other state or territory in the United States. The 1909 crop made an actual commercial test for beets shipped of over 17 per cent.

But irrigation here, under systematic, modern methods, depends upon storage, reservoiring for reserve supply and is in its incipency. Several large enterprises are projected and some have progressed sufficiently to begin colonization. In the class are those of Springer Ditch Company, at Springer; Farmers' Development Company, at Miami; French Land & Irrigation Company at French, and Maxwell Irrigated Lands Company, at Maxwell, all in Colfax county, New Mexico.

These projects, though not completed, show the enormous water supply furnished by the Sangre de Cristo watershed. Taking as one instance, the Maxwell Irrigated Lands Company, which will take water by large ditches from both the Vermejo and the Red rivers. The Vermejo ditch is completed and from this ditch alone ten large reservoirs were filled the present season by the middle of May and there has been a large amount of water running to waste down the Vermejo which could not be utilized.

The Red river ditch is being constructed and when completed this company will have much more water than can be stored and used by the reservoirs in their system.

New Projects Now Under Way.

There are three other projects which have not got much beyond the formative stage of perfecting titles to water rights, surveying and engineer's estimates of costs of construction. There are the Las Vegas project, now under construction by D. A. Camfield, the noted irrigationist of Colorado; the Lake Charette projects; controlled by Hornstein and Hartoey of Springer, and the Eagle's Nest project, controlled by Charles Springer of Cimarron, New Mexico.

This Eagle's Nest enterprise will, without doubt, become one of the greatest in the west, covering as it will over 100,000 acres of exceptionally rich land, with low construction cost and an abundant supply of water.

None of these is government project and I cannot say much concerning any one of them except that every one will bear the closest scrutiny by persons who desire to come among us and make their future homes here.

There are great possibilities for irrigation in the rich valleys of the Mora and in the Taos country.

It is to this country that we invite the people of the world to help in making the greatest state in the Rocky mountain region.

URNS WASTE INTO WEALTH.

Modern System of Digging Ditches Most Powerful Factor in Watering Waste Land and Draining Swamps.

THE slow and painful method of making drainage and irrigation ditches by spade and plow is a thing of the past. Today great machines, propelled by steam, gasoline or other power are opening up ditches to any width or depth desired, leaving the sides clean, sloped at proper angles and in every way a thing of usefulness and beauty. These machines are plowing their way through the swamps of the east to make arable useless wet lands and are opening up the desert lands of the west for irrigation purposes, and thus are mighty factors in the development of our agriculture.

The scientific principle of ditch building is that a ditch is perfectly made only when it is cut true to grade, the banks sloped to any desired angle and with bottom and banks left as firm as nature made them. The waste banks

irrigation ditches at a cost per cubic yard cheaper than they can be dredged, but this is only one factor of the problem. This machine digs the ditch complete with sloping sides in one operation and a dredge does not.

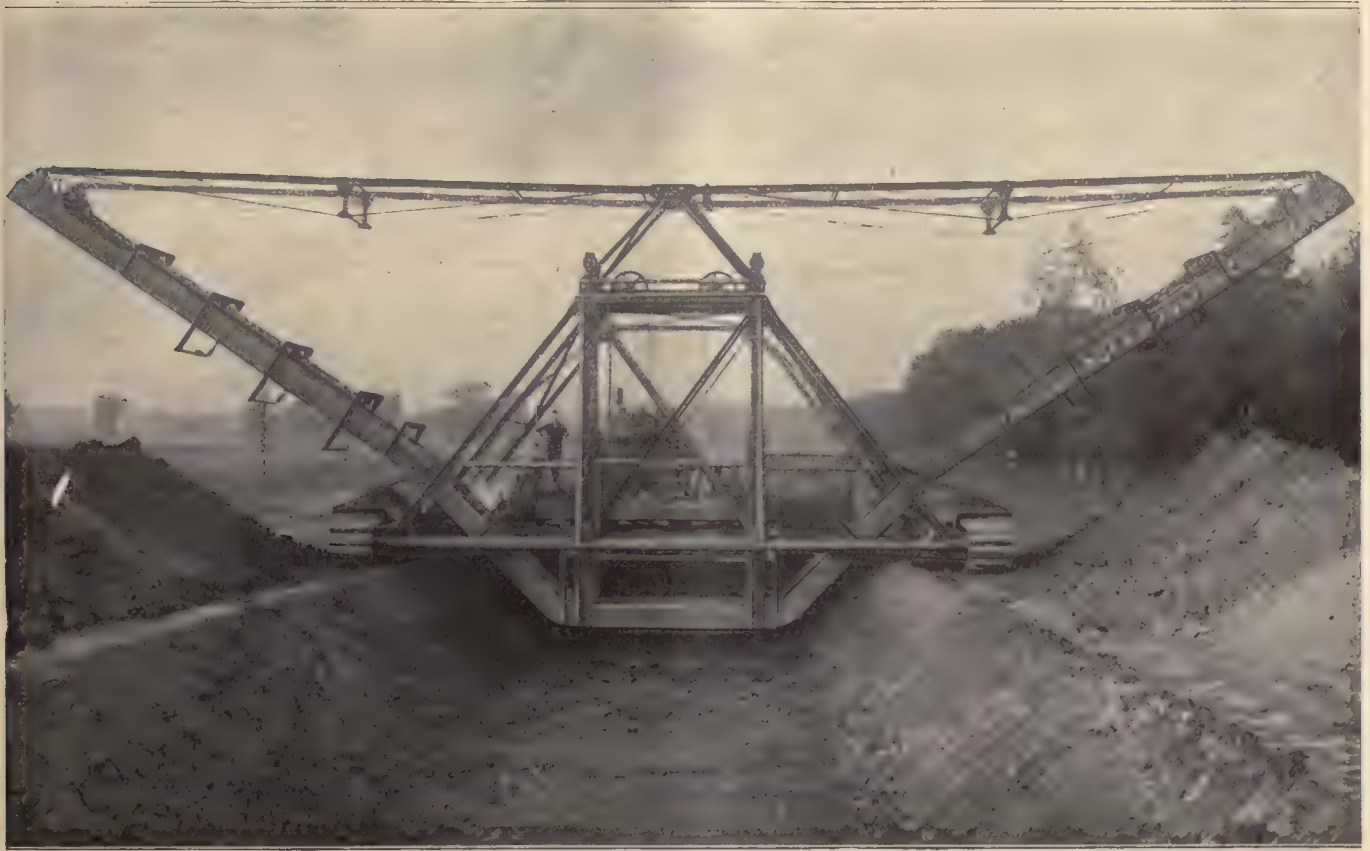
There must, therefore, be added to the cubic yard of cost of dredge work the additional cost of trimming and sloping these sides. Other important features of this machine and its work are:

There is a gain in the life of the ditch, since the sloping banks do not cave or easily wash.

There is a gain in the water carrying capacity of the ditch which enables a correspondingly smaller sized ditch to do the work required.

Then there is the very important gain of being able to dig the ditch from mouth toward source and thus drain the land along the lower stretches for immediate cultivation while the upper stretches of the ditch are being dug.

The Austin Drainage Excavator constructs a permanent ditch which keeps its shape, at a lower initial expense than it can be built for by any other method.



Rear view of Type "A" Machine digging ditch with 18-foot bottom, motive power gasoline engine.

The units or panels making up the platform traction are so connected that they "bridge"—that is, the load on each pair of wheels is distributed over a multiplicity of panels or units, instead of only one. This holds true for whatever position the wheels take. As a result, the Austin Rolling Platform Traction will carry a machine over very soft ground—almost any ground that does not require a boat.

must also be placed at a sufficient distance from the ditch to prevent caving.

The most notable development in ditching machinery is that made by the F. C. Austin Drainage Excavator Company of Chicago. Each of the machines manufactured by this company has features that fit it particularly for its work. They have all been tried out in the ditch and on the levee and are now successfully working in large numbers.

The Austin machines are made especially with one or two exceptions for drainage and excavation work and for such work the manufacturers claim they have no equal in this country.

There is something besides mere digging in ditching economics, and this is a fact to be remembered when a machine is offered at what appears to be an astonishing low price. An Austin Drainage Excavator will excavate

When an irregular channel is once created the tendency of flowing water is to increase the irregularity by undermining the banks and forming bars in the channels, thus choking the entire waterway by the deposit of silt. The cost of maintaining such a ditch will exceed in a short time the original cost of construction, and this is a feature which must always be considered in the construction of ditches.

The bottom of the ditch must be true to grade and free from roughness. The size of the ditch must be true and smooth and sloped back from the bottom at an angle flat enough to prevent the earth from falling, caving or slipping.

The earth below the true planes of the bottom and sides must be left undisturbed and as nature made it.

(Continued on page 565.)

MARKED INCREASE IN PUMPING IRRIGATION.

THERE is great activity this year in this section of the irrigated West in irrigation, by pumping. This is particularly true in the Arkansas valley and in eastern Colorado. The successes in the Garden City district of the Arkansas valley, and east of Colorado Springs have directed attention to this means of irrigation and reclamation of areas otherwise impossible of reclamation, and the Eighteenth National Irrigation Congress meeting at Pueblo, September 26-30, has acted as a stimulus to endeavors along this line.

Farmers on arid and semiarid lands, where it is feasible to obtain water from wells, underground flow, or nearby rivers and ditches, may enter into a sort of school of instruction and be taught the advantages and safeguards to crops by electrical pumping systems, within the next few months.

After the irrigation congress and exposition are over, and at Denver, October 8, it is proposed to have a big electrical pumping congress in the big auditorium and invite agriculturists of the state and the adjoining western Kansas section of the Arkansas valley which has been the pioneer in this movement, to attend.



Rock River, Wyoming, with Irrigated Meadows.

The Northern, Central, and Southern Power companies will probably have a number of working exhibits, showing various methods of electrical pumping to reclaim lands. Formerly, the high cost of power retarded such development, but in recent years the cost of power has declined, and it is felt its use is now a paying proposition.

Activity is now pronounced in the territory east of Colorado Springs, formerly regarded as almost hopeless from the standpoint of reclamation except by dry farming. Also this is true in the Garden City, Kansas, district of the Arkansas valley, where two projects are now being proposed—one to take care of 8,000 acres, and another having a 5,000-acre area.

Government statistics show that there are nearly 600 million acres of arid and semiarid land in the United States. Electric power experts claim that a large portion of this could be reclaimed by pumping water from wells, rivers, ditches, underground flows and by draining water from swampy land.

The managers of the congress propose to obtain the services of prominent reclamation experts to address the meetings. The problems encountered by the agriculturists will be ascertained by a question box.

Farmers in the East are now adopting systems of supplementary irrigation. One of the experts to address the congress will be Herman Russell of Rochester, N. Y., who is one of the foremost advocates of supplementary irrigation in this country. Russell stated that New York suffered severely last year by drought, which could have been avoided by supplementary irrigation.

This branch of the ancient art of irrigation, so common in California and in the state of Washington, and practiced for many years in the well-known Garden City district of the Arkansas valley, has not been in common use heretofore in eastern and southern Colorado. The preachments of the Irrigation Congress and the publicity aroused by means of the congress have brought attention in all parts to this means of applying water to the land in sections where gravity irrigation was not possible or feasible.

It is felt, and attention is being brought to the fact, that investors and irrigation engineers should look into the possibility of reclaiming arid lands on the plains by pumping. The acreage is vast, and the soil when watered is fertile. The first question is whether there is adequate supply, and the next whether the cost of pumping would be low enough to make ventures of that kind profitable.

Tests have shown that a large part of the Great Plains area is underlaid with water, and there is no doubt that in many localities the supply is great enough to reclaim in the aggregate a large area of land.

Power for pumping can be supplied in two ways: Either by power stations, local, or in the mountains and conveyed by distributing stations and lines to the place desired; or by means of denatured alcohol.

It requires intensive cultivation to make irrigation of this kind profitable, and that is exactly what exists in the Garden City district of the lower Arkansas valley in western Kansas. There are located in that district several large and many private pumping plants, all in successful operation.

Years ago, Major Powell, then director of the United States geological survey, expressed the opinion that the Central Plains region might ultimately be put to good use in this way. From its farms, the markets of the central West can be supplied. Anyway, it is being felt more and more that it is a profitable field for investigation by the experts, and the great impetus and influence of the Eighteenth National Irrigation Congress applies in this as in many other instances.

In this connection, the fact that the National Irrigation Exposition will be held at Pueblo, September 19-October 1, in connection with the Irrigation Congress, has a salutary effect, since one of the principal features of the exposition will be displays of pumping and pumping machinery.

(Continued from page 557.)

clear days, the Spanish Peaks which lie to the southwest. There is no more delightful mountain view in the country than can be had from the mesas and hills lying east of Fountain.

There are many ranches yet to be disposed of in this tract and it is safe to say that there is not a ranch on the entire project, after being properly cultivated, fruit trees put out and some of the land seeded to alfalfa, that will not readily sell for twice the figure now being asked by the company.

A large acreage of the Fountain tract has been set out to cherry trees which will, when in bearing, bring the value of the land up to \$600 or \$700 per acre. Cherries in this section produce not less than \$100 per acre per year, and frequently one or two times that amount. It is not uncommon to hear of a well matured cherry orchard which is earning \$200 per acre and one good feature about this is that the large merchants in Denver and other large cities of the state frequently purchase the fruit on the tree and do the picking and shipping themselves which relieves the settler from all worry attendant upon poor help at a critical time in the crop development.

An exhibit will be made of Fountain Valley products both during the time of the State Fair and the Irrigation Exposition.

For additional information concerning this land address the Fountain Valley Land & Irrigation Company, Colorado Springs, Colorado.

Send \$2.50 for the Irrigation Age 1 year, and cloth bound copy of the Primer of Irrigation

(Continued from page 563.)

The material excavated from the ditch must be deposited far enough away from the edge not to work or slide back and not to bring a caving pressure on the edge of the ditch.

The Austin Drainage Excavator does all of these things and by delivering the earth at a distance from the edge of the ditch insures a berm of practically any desired width, thus insuring that the waste banks will never be returned to the ditch by erosion nor will the banks cave as is the case when torn up by dipped dredges that can deliver the waste banks only immediately adjacent to the ditch.

The F. C. Austin Drainage Excavator Co. also manufactures the Austin Levee Builder, a machine which takes dirt from low grounds and places it in an embankment. Then there is the combined levee and ditch excavating machine, the Austin Dragline Excavator, which has an even wider range of usefulness than the steam shovel.

Another wonderful machine is the Austin Stiff Leg Drag Line Trench machine, intended for digging extra wide trenches for large brick or cement sewers. This will make a cut of twenty-five wide and twenty-five or more feet deep, loading the dirt into wagons or cars. At the depth of fifteen feet it will deposit the dirt on both banks.

The Austin Tile Ditching Machine is the only machine that will dig trenches for tile in materials of all kinds. It digs 12, 15 and 18 inches wide and to a depth of six feet at the rate of 3,000 to 5,000 lineal feet per day. This machine can be transported over the ordinary roads from job to job at the rate of two miles per hour.

The Austin Sewer Excavator is a machine that will do more and better work on city streets than can be done by from 100 to 150 men digging with pick and shovel. It does better work because the trench is cut to grade, leaving the walls true and as straight as the engineer's tape line. Deep digging does not decrease the output to any great extent, while with hand labor the deeper the trench and the harder the material the greater becomes the cost.

All of the machines described above are self-propelled and when equipped with an Austin Rolling Traction Platform will ride on any material that does not require a boat to cross.

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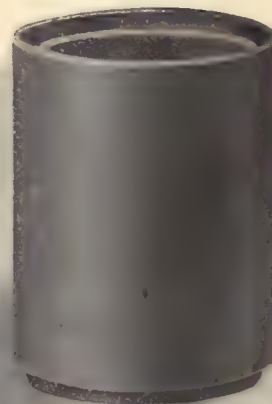
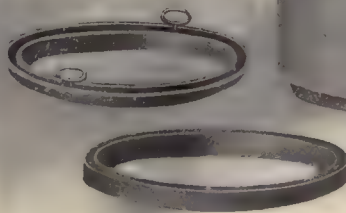
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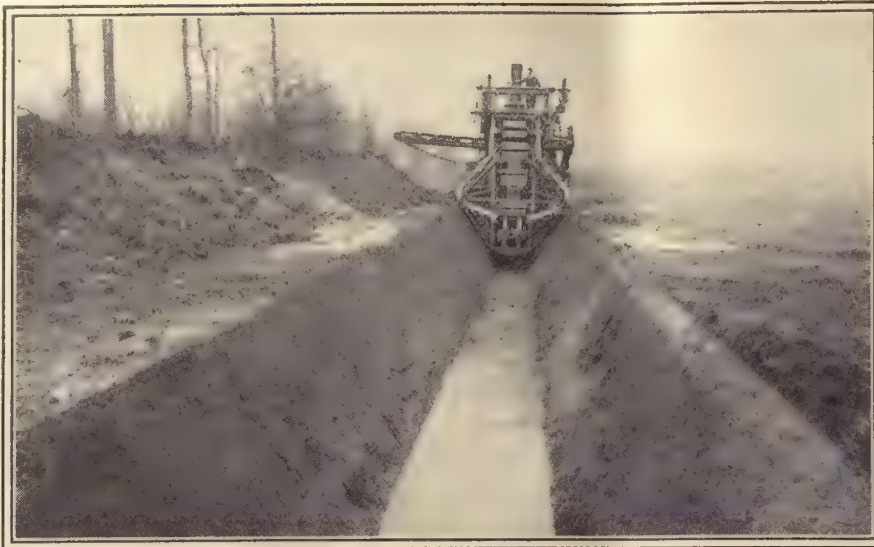
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Requires no water for its operation, other than for boiler. Hence, excavation may be begun at mouth of ditch and proceed towards its source. This permits land along lower stretches of ditch to be drained and put into crops while upper stretches are still being excavated.



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Austin Drag Line Excavator

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Reclamation Notes

CALIFORNIA.

Government engineers are prospecting lands in Dry Lake region of Modoc county for the purpose of determining those which can be brought under irrigation.

The Yolo Consolidated Water Company of Woodland, Yolo county, has sold its water-rights and interests to Lieutenant-Governor Warren D. Porter of Watsonville and J. W. Forgeus of Santa Cruz. The new owners propose to build a water system which will cost several millions of dollars. The proposed system will irrigate many thousands of acres of land in Yolo, Solano and Lake counties.

A mutual corporation has been formed at Yerma, headed by J. W. Tibbetts and W. F. Holt of Redlands, with a capitalization of \$250,000 as the preliminary steps to put in a submerged dam in the Mojave river about three miles from Otis. The company has filed on 20,000 inches of water in the river at this point. The plan is to build a series of canals, six feet wide and eight feet deep, and the water raised by the dam so that it will flow by gravity over 460,000 acres of rich desert land. It is estimated that the cost of the project will be about \$3,000,000.

R. D. Cutler of Red Bluff has filed on 5,000 inches of water from the Sacramento river a few miles south of Red Bluff, for domestic and irrigation purposes.

Dr. P. L. Hamilton and Dr. Hal M. Parker of Chico, have filed on 20,000 inches of water from Mill Creek, near Morgan Springs, Tehama county, for power and irrigation purposes. No definite plans have been announced.

The Sacramento Irrigation Company has filed articles of incorporation, with a capital stock of \$100,000. The principal office of the company is at Portland, Oregon. The company has filed on 80,000 inches of water in the Sacramento river three miles north of Red Bluff. The incorporators are J. W. Ivey, Norman R. Smith and W. W. Woodward.

A pump is being installed on the east side of Honey Lake to pump the water from the lake into a ditch system that will convey it to 20,000 acres of land in the vicinity of Amedee in Lassen county. The land is to be colonized.

A. A. Anton, residing in the Biggs section near Oroville, has filed on 100 miners' inches of the water of Dry creek for irrigation purposes.

The Board of Directors of the South San Joaquin Irrigation District has established permanent headquarters at Manteca.

A proposition to dissolve the Rialto Irrigation District was defeated by a vote of 71 to 54.

C. M. Maze, who owns a ranch near Modesto, has installed a pumping outfit at a cost of \$1,000 with which to irrigate his late crops.

The Madeline Irrigation Company of Madeline is taking water from Tule lake to irrigate 1,500 acres of land near that city.

A decision in favor of Osborne Burke and others has been rendered by the Supreme Court of California which removes all restrictions on the matter of taking water from the Walnut Irrigation District ditch. The Walnut Irrigation District sought to restrain the plaintiffs from taking water from its ditches and when the case was brought up in the superior court a decision was rendered in favor of the plaintiffs. An appeal was then taken to the Supreme court, with the outcome mentioned above.



No. 3. Traction Gasoline Machine crossing the high Sierras of Eastern Washington, where fuel and water are not to be had. We made the 25 mile move in 8 hours, using 20 gallons of gasoline at 19c per gal. We had no team nor needed any. The one in the picture did not belong to the machine.

THE DESERT DRILL

This is a Standard KEYSTONE Traction Cable Drill driven by a two cylinder double opposed gasoline engine. Size 3 has a 22 H. P. engine and is guaranteed for 500 ft. depths. Size 5 has a 30 H. P. engine and is guaranteed for 1000 ft. with manilla cable or 1500 ft. with wire line.

Requires no fuel but gasoline.

Requires no water except for cooling engine and a little for the hole.

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COLORADO.

Farmers in the vicinity of Golden are becoming interested in irrigation by pumping. R. Reed Morrill, manager of the Golden Illuminating Company, has sunk a 12-foot well and installed a centrifugal pump and irrigates a large tract.

The North Fort Reservoir & Irrigation Company has filed articles of incorporation and will have its main office at Fort Morgan. Water will be taken from the South Platte river to water 16,000 acres of land in Morgan, Logan, Sedgwick and Phillips counties. The capital stock of the company is placed at \$200,000, divided into 2,000 shares at a par value of \$100 each. The dam will be completed in March, 1911.

The old town ditch which has served the town of Las Animas for irrigation purposes for the past twenty-six years, will be siphoned and used in the future by the farmers living near Lamar. The contract for putting the ditch underground has been awarded to the Las Animas Ditch Company and the Marshall Murphy Construction Company at a cost of \$10,000.

Rollo Wilson of Denver, president of the North Poudre and Weld County Reservoir and Ditch Company, has filed plats covering claims on many reservoirs. The system contemplates the building of fourteen reservoirs in Weld and Larimer counties, costing \$2,000,000 and the enlargement of the Harrigan and various reservoirs owned by the North Poudre Irrigation Company of Greeley. This project will provide irrigation for thousands of acres of land near Carr in Weld county, as well as a large acreage in Weld county.

An irrigation district known as the "Hunter Mesa Irrigation District" has been formed. J. T. Selby and J. E. Stauffer of Rifle and C. C. Parks are directors of the new district.

The contract for moving 600,000 cubic yards of dirt on the main canal of the Pueblo & Rocky Ford Irrigation Company has been let.

Work on the Shaeffer reservoir on Beaver Creek is nearing completion. The purpose of the dam is to store water for Beaver Park, a large tract of land lying near Florence.

Through the efforts of the Antlers Orchard Development Company, of which Colorado Springs capitalists are the chief officers and owners, 4,000 acres of land in the vicinity of Glenwood Springs is to be reclaimed by the means of a system of irrigation now being installed. A reservoir with a capacity of 174,000,000 gallons is being built. The land was formerly the property of the Farmers Company, whose dam burst fifteen years ago, and no improvements have been made on it since then until the present company purchased it. T. E. Curtin is president of the concern, A. E. Sunderlin vice-president. Lee Hany, formerly advertising manager for the Colorado Midland Railroad is a member of the company and has opened an office in the Equitable building in Denver to handle the lands. The land to be reclaimed lies on the line of the Denver & Rio Grande railroad and is between Antlers and Silt.

Kingsbury Bros., contractors of Masters, have commenced the tunnel reservoir on the Laramie river for the Greeley-Poudre irrigation system which will cost \$250,000. A dam 1,600 feet long will be built across the river to force the water through the big tunnel into the Cache la Poudre, from where it will be distributed into the ditches and reservoirs of the irrigation system. The dam will be 48 feet high and will be erected at a point where the river turns north and flows toward the Wyoming line. The reservoir will have a capacity of 170,000,000 cubic feet of water.

Improvements are being made in the Holbrook Irrigation System. Reservoir No. 1 is practically completed. This reservoir will hold about 7,500 acre feet of water and will cost about \$25,000. The Dye reservoir is not so far advanced and will not be completed for some months. When finished it will add about 5,000 acre feet more storage capacity to the Holbrook system. This reservoir will cost in the neighborhood of \$18,000.

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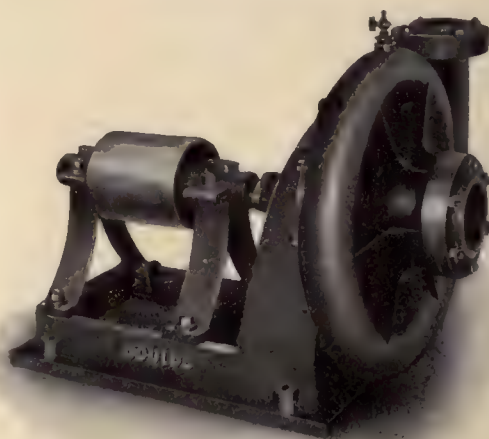
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It is reported that active work on the Colt project, involving Lake Meredith and the irrigating of 200,000 acres of land in Otero and Bent counties, will be commenced within the next month.

An estimate of the cost of the proposed Hardscrabble Irrigation District places the cost at \$782,000, or \$65 per acre, provided no more land is signed up.

Plats have been filed by W. D. Gould, James Gould and E. S. Gould for a new irrigation proposition on Crystal creek near Crawford. The amount of land to be watered is 3,600 acres. The reservoir will be formed by a dam forty-eight feet high, and will contain 56,407,000 cubic feet of water. The ditch will be about eleven miles long, with a carrying capacity of 300 feet. The estimated cost of the project is \$35,000.

The Lower Rogers Mesa Irrigation District has purchased 400 shares of the capital stock of the Park Reservoir Company. The Park reservoir is about the same distance from Rogers Mesa as the Dog Fish, the Crater, or the Holy Terrors reservoirs. A ditch nine miles long is now under construction which will carry the water to Leroux creek.

It is rumored that an irrigation project which will reclaim 60,000 acres of land south of Hayden and Craig, will be commenced in the near future. It is proposed to take water from Williams Fork a few miles above the Erry ranch, carry it across the divide, and onto the Bear River slope.

The Western Reclamation and Development Company and the East Colorado Springs Land Company are perfecting plans for developing the underground flow of the waters of Sand Creek. It is the intention of the promoters to furnish water for about 5,000 acres of land which will later be cut up into small tracts and ranches. The system of these companies is to build a dam by driving piles into the bed of the creek until they strike hardpan, and the spaces between the

piles are then filled with cement. The work is under the direction of J. B. Emmons of Denver.

A western slope irrigation scheme has been started by a syndicate of Colorado Springs capitalists, to water thousands of acres of land in the San Miguel river valley in Montrose county. The land which is to be opened up lies 50 miles south of Grand Junction and 25 or 30 miles southwest of Montrose. In order to bring the water from the headwaters of the river where the syndicate has options on the water-rights, it will be necessary to build 22 miles of flume. As the proposition now stands it is the intention of the promoters to build a wooden flume of seasoned oak timber the entire distance. Later on a steel conduit will be built in a large groove along the mountain side so that its destruction by landslides will be practically obviated.

IDAHO.

Ex-Senator F. F. Pettigrew, H. L. Hollister of Chicago, and several others, have purchased 40,000 acres of desert land from the Northern Pacific Railroad Company and will irrigate it. The land lies near Moses Lake and the purchase price was \$40,000.

Application for a permanent segregation and maps of the system of irrigation to be used have been filed in the state land office by the Grasmere Irrigation Company. The project is situated in the center of Owyhee county and surrounds the smaller tracts belonging to the company of that name. The temporary withdrawal of the land was granted June 1st and the work is being pushed, with the prospect of an opening late this fall. The price of water-rights is placed at \$65 per acre, with a maintenance fee not to exceed 50c per acre.

T. R. Jones, John A. Early and associates have filed an application for the segregation of a large body of land in Bingham county. Their application seeks to enlarge the original segregation for what is known as the Blackfoot North Side Irrigation project which covers 35,000 acres of land in Bingham county.

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Sold in any lengths of 10, 15, 20, 25, 30, 50 yds. and up to 100 yds.

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Additional saw alone - - - \$1.50 per yard

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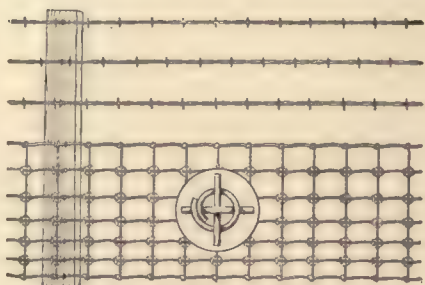
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MONTANA.

Acting Secretary of the Interior Pierce has granted an extension of five years for the completion of the Dearborn irrigation project.

Thos. L. Shaw, a farmer residing in the Ruby Valley near Laurin, has filed a suit in the district court against Francis Redfern, a neighboring farmer, in which he alleges that Redfern refused to allow him to use water with which to irrigate his crops from a ditch owned jointly by them and others. A temporary injunction restraining Redfern from interfering with Shaw irrigating his crops was rendered.

It is rumored that a large irrigation project to reclaim 14,000 acres of land lying north and east of Franklin will be commenced in the near future. The reservoir site is located a short distance east of Franklin, about eight miles east of Hedgesville. Water will be supplied from the flood waters of the Snowy mountains. Feeders to the reservoir are projected out of Careless, Alkali, Swimming Woman and Willow creeks. The only doubt concerning the project is whether or not the reservoir will be large enough to hold the amount of water desired. Should this project be undertaken it will mean the construction of a dam 300 feet long and 40 feet high. It is estimated that the project will cost \$300,000.

The farmers in the vicinity of Dillon are planning to form an irrigation district for the purpose of having the reservoir owned by the Red Rock Reservoir and Irrigation Company pass into the hands of the ranchers. Mr. George R. Featherly, who is taking a leading part in the movement, is authority for the statement that the proposition is meeting with favor among the farmers and that all the large water users are in favor of forming an irrigation district and taking over the reservoir in case the present owners will accept a reasonable price for it.

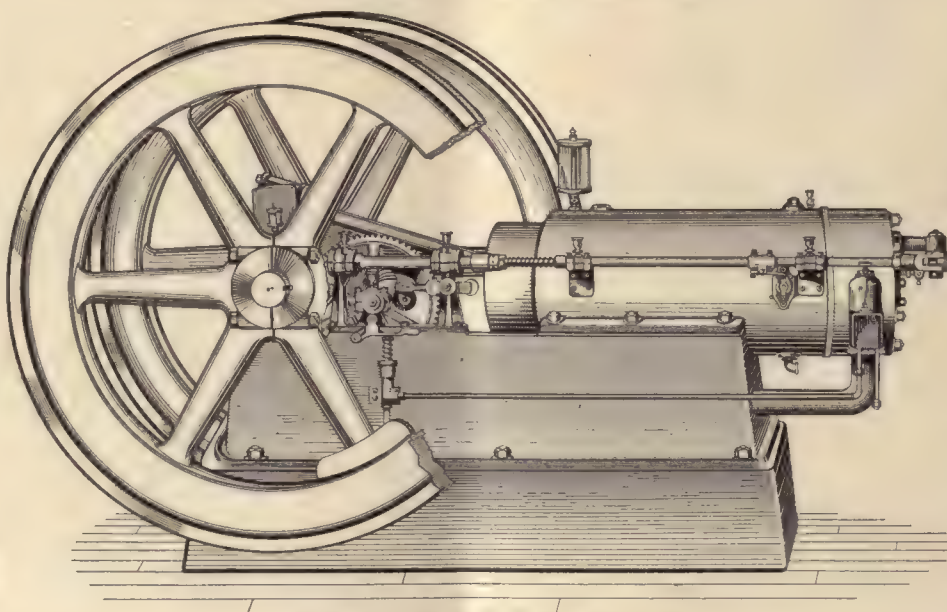
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NEW MEXICO.

Territorial Engineer Vernon L. Sullivan has approved the plans of the Camfield Irrigation project, which will bring thousands of acres of land lying close to Las Vegas under irrigation. D. A. Camfield, the promoter, gave bond for \$100,000. The storage reservoir will have a capacity of 22,000 acre feet; the dam will be 1,400 feet in length and 71 feet high. The project will cost \$1,000,000 and the board of trustees of the Las Vegas grant has contracted to turn over to the Camfield company 17,000 acres of the grant in payment for the system. Work was commenced on the project on September 2, and will be completed in time for the 1912 crop season.

Indian Agent Shelton of Ship Rock is constructing a large irrigation canal to cover about 10,000 acres of mesa and valley land. It will be for the use of farms cultivated by the Indians.

The application of H. C. Kinsell and J. M. Reeves of Stanley for an irrigation project has been approved by Territorial Engineer Sullivan. The proposition is to dam Armijo arroyo and a tributary arroyo for the purpose of storing water to irrigate 13,000 acres of land twice a year. This land has formerly been dry farmed. The land to be reclaimed is almost all homestead land and lies between the town of Stanley and the New Mexico Central railroad. The main reservoir will be created by a dam 85 feet high, 143 feet wide at the bottom and 1,885 feet at the top, impounding the water in a natural rock bottom dam site. The second reservoir will be made by erecting a dam across an arroyo which will be crossed by the main canal from the first reservoir. Work is to commence by February, 1911, and be completed by August, 1913.

The irrigation plant at Portales, which is the work of the Western Construction Company of Wichita, Kansas, has been completed at a cost of \$350,000. The plant irrigates 10,000 acres of land. There are seventy pumping stations connected with the system which have 72 miles of transmission line with a central power station located at Portales.

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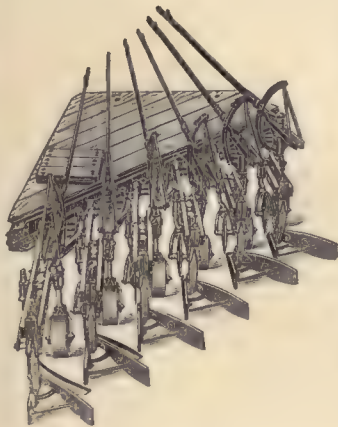
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5, 6, 8, 10 and 12 Furrows



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Dear Sirs:—In reply to yours of today, asking how I like your Ten Bottom Mogul Engine Gang Plow; I will say, I have been in the Steam Plow business for eleven years and had, I think, the first Steam Plow in Iowa (that I know of, at least), and I have never seen a plow that would take hold in the heavy gumbo land like your plow and scour right off as it did. The heavy double beams, the easy adjustment of the plow and of the beams as well, the shape of the mouldboard make it (in my judgment) the best plow for our heavy gumbo land I ever saw. When I tell you our 22-horse engine walked off with ten 14-inch plows, plowing in the sod, it speaks for the easy draft. You need not hesitate to refer any one to us.

Respectfully yours,
(Signed) J. Z. ADAMS & SON.

The Platform is level; there are no openings for the operator to fall into. Each gang is controlled by an individual lever. Notice how the levers are "bunched" together near the center. The operator has all the levers within arm's reach and can operate them from the center of the platform. This saves walking across the platform whenever it is necessary to raise or lower the bottoms. Like everything else we make, these plows are "Backed by an Unqualified Guarantee."

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The Irrigation Age Company,

112 Dearborn St., Chicago, Ill.

The work on this system was commenced last February and was completed early in August. The wells are sunk 120 feet deep but the water is within 45 feet of the surface. The engines at the Portales plant have 1,500 horse power with 2,750 horse power gas engines and producers.

The bonds recently voted by the Orchard irrigation district near Farmington, for the purpose of building a project known as the Illinois ditch, have been approved by Judge McFie. Work will be commenced on this project this month. This project will reclaim 12,000 acres.

OREGON.

The Wheeler Reservoir Company of Lakeview, is constructing a dam at the mouth of Dry Creek with which to impound sufficient water to irrigate 10,000 acres in Goose Lake Valley.

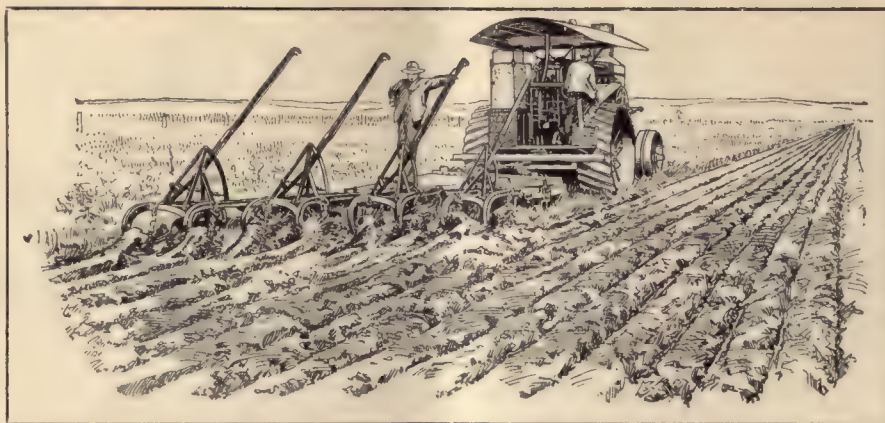
The Rock Reservoir & Canal Company proposes to irrigate 5,000 acres of land lying between Pilot Rock and the junction of Stanley and Alcott creeks, eight miles south of the Rock. The company is capitalized for 10,000. Stockholders in the company are the Cunningham Sheep and Land Company, the J. E. Smith Livestock Company, Herbert Boylen, Bird Brothers and Hascall Brothers.

The Snake River Irrigation District, Ltd., is a new corporation organized in Malheur county for the purpose of irrigating 12,000 acres of land lying between Malheur Butte, two miles west of Ontario, and on the north side of the Malheur river and west of the Snake river, and extending to a point opposite Weiser, including Dead Ox flat. The lands are to be irrigated by means of current wheels to be installed in the Snake river, the wheels to be run by the power of the water. This plan has been tried out at Pasco, Wash., on the Columbia river, where water for irrigation purposes has been lifted 220 feet. The plan of the Snake river irrigation district is to install two of these pumping wheels in the Snake river, one of which will be at the mouth of Jacobsen's gulch, five miles north of Ontario. One of these plants will lift the water 46 feet above the river, and the other plant will lift the water 103 feet above the river.

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It is expected that work on the Columbia Southern Irrigation Company's segregation will be resumed soon and the project carried to completion. This segregation comprises 27,000 acres of land lying adjacent to Laidlaw and northwest of Bend, and it is stated that the company now in charge of the enterprise will ask that an additional 8,000 acres be segregated. The enterprise is now in the hands of the Oregon-Washington-Idaho Finance Company, which took over the affairs of the Columbia Southern Irrigation Company after they had been in the courts for several years. The project involves the building of a concrete dam on Tumello creek, and from there a feed canal seven miles long will be constructed to Tumello Reservoir. This is a natural reservoir site and embraces 1,405 acres. The system will be turned over to a Water Users' Association when 80 per cent of the land is sold. This is a Carey Act project and is under the supervision of the State of Oregon.

Sixty thousand acres of Carey Act land lying in the valley of Jordan Creek is practically ready to be placed on the market. Water for this project is taken from Jordan and Boulder creeks. All but 1,880 acres of this land lies in the State of Oregon—the amount mentioned lying in Owyhee county, Idaho.

It is stated by F. S. Stanley, who is heavily interested in the Deschutes Irrigation & Power Company of Portland that the affairs of this company have been settled and that the lands will be on the market within the next month. It is understood that J. G. White & Co., of New York, will be in charge of the construction and maintenance work.

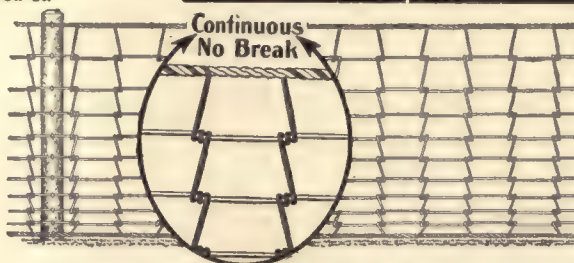
UTAH.

Farmers in the Plain City district are planning to store the flood waters of Weber river for irrigation purposes by constructing reservoirs in that section of the country.

A company composed of S. L. Chipman, James H. Clark, John Evans and Eli J. Clayton of Utah county, are planning the reclamation, by pumping, of a large tract of land northwest of Lehi. It is stated that the new com-

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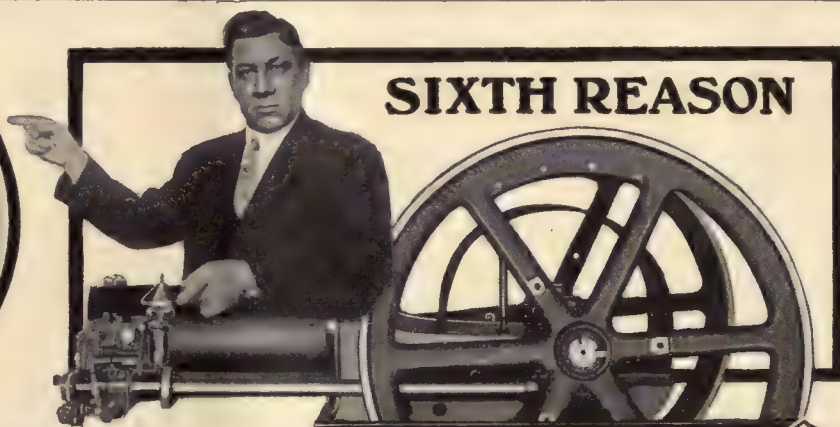
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But they seem to think a whole lot more about the first cost of a gas power plant than they do about its economy in the long run. **For Instance** Ultimately you will invest a great deal more in fuel than the entire first cost of your engine, yet a whole lot of gas engine buyers overlook entirely the vital question of fuel economy. ¶ Now, during the past thirty-four years we have frequently found it necessary to make competitive tests, and in every case we have been able to operate the OTTO on 10 to 30% less fuel than the competing engines * * * and the major portion of this saving is due to the governor shown above. ¶ This is the governor we use on OTTO Engines up to 40 H.P. It is of the centrifugal ball type and extremely sensitive, admitting only sufficient fuel to keep the engine at its normal speed under varying loads. ¶ Where OTTO Suction Gas Producers are used gas is made so cheaply that the question of fuel economy is not such a vital one as is the question of close regulation. On engines of 50 H.P. and over, we use our throttling governor which accomplishes the close regulation so essential to gas engines, especially for the milling industry. ¶ Now, if you are more interested in obtaining increased efficiency day in and day out, year after year, during the entire life of your engine than you are in saving (?) a few dollars in first cost, we want your name on the attached coupon, so we can send you the proofs by return mail. ¶ Will you send the coupon right now?

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pany will incorporate for \$200,000. Water will be ready for next season's crop. Electric engines will be installed to operate the pumps.

J. M. Lauritzen of St. George has filed an application with the state engineer for 100 cubic feet of water from Kanab creek in Kane county, to be used in the irrigation of 15,000 acres of land near Glendale. This project involves the construction of a canal 30,000 feet long, which will carry part of the water of Kanab creek over the divide near Glendale to the Virgin river, in which stream the water will be carried to the point of diversion.

Frank Robinson of Giles has filed application with the state engineer for four cubic feet per second of the flow of South Creek and Dugout creek in Garfield county, for the irrigation of 160 acres of land.

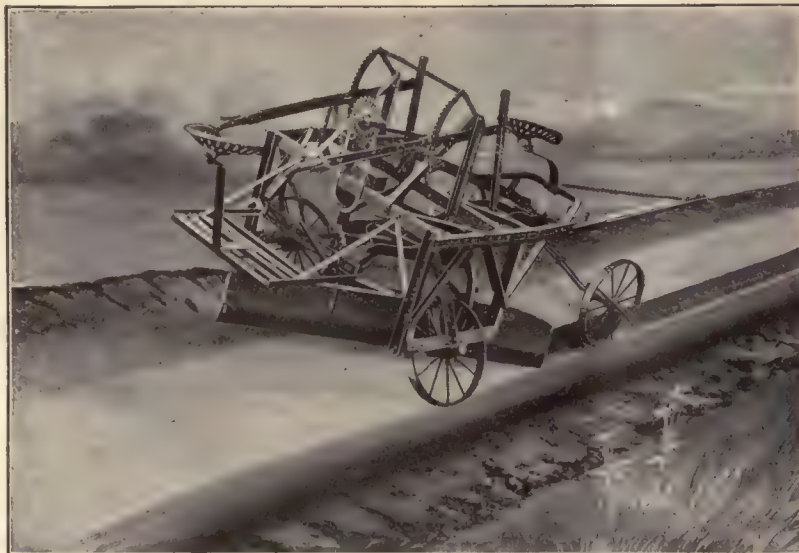
Clarence I. Johnson and J. E. Strain of Roosevelt have filed an application with the state engineer for 320-acre feet of the waters of Lake Fork creek in Wasatch county. The water is to be used to irrigate 1,160 acres of land.

The Colorado Park Irrigation Company of Uintah county have filed an amendment increasing the capital stock of the company to \$57,560. M. J. Hersey is president of the company and Roy E. Kurtz secretary.

Marie D. Wattis of Ogden has made application with the state engineer for $\frac{1}{2}$ cubic foot of water from a slough near Weber river in Weber county. The water in the slough is seepage water from irrigated farms in the vicinity and will be used to irrigate 40 acres of land. A pumping plant will be installed.

The Emery Land and Water Company of Rochester, Emery county, has filed an application with the state engineer for 1,000 acre feet of water from the Muddy creek, for the purpose of irrigating 22,000 acres of land in Emery county.

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It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

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The Utah-Idaho Land and Water Company have filed articles of incorporation with a capital stock of \$100,000, with offices at Logan. The company proposes to irrigate 4,000 acres of land lying in Box Elder county around the precinct of Showell. There are 7,000 acres of land in the tract and 3,000 acres will be developed by dry farming.

Two reservoirs will be constructed between Showell and Snowville for storage purposes. The officers and directors of the company are Joseph Howell, president; Joseph T. Pond, vice-president; Herschell Bullen, secretary, and Jas. W. Hendricks, Roy Bullen, Harold A. Lafount and George M. Showell, directors.

The Ouray Valley Land & Water Company, a corporation which is said to be backed by the United Realty & Investment Company of Vernal, has filed an application with the state land board asking for 23,000 acres of land to be set aside for them under the Carey act. The land to be reclaimed lies between the Uintah and White rivers and the Dry Fork of the Ashley river, from which streams water will be taken. R. S. Collett and B. D. Nebeker of Vernal who are at the head of the company, will spend about \$365,000 putting the project in shape.

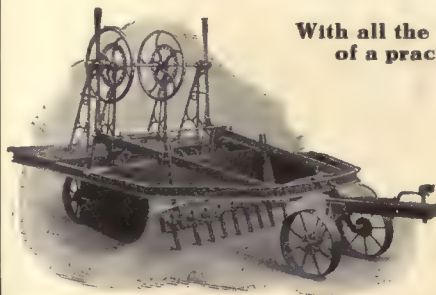
H. J. Cox, Chas. Oakden and Jos. W. Tanner of Beaver City have filed an application with the state engineer for one cubic foot of water per second of the flow of Bob Patterson's stream in Beaver county for the irrigation of 80 acres of land.

The Utah Light and Railway Company has announced that it is now prepared to furnish electric power for pumping water from Weber river to the stretch of land known as Sand Ridge, near Ogden. This land has heretofore been considered worthless but with irrigation will prove very productive.

WASHINGTON.

Under supervision of President E. A. Bryan of Washington State College, work on the 2,000-acre reclamation

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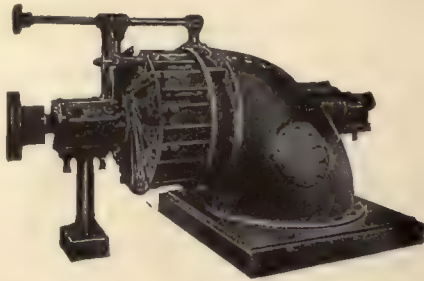
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project on the Snake river near Starbuck is rapidly nearing completion and will be placed on the market early in October. Two centrifugal pumps with a capacity of 1,500 gallons per minute are being installed. Power will be secured in the Tukanon river near Grange City. The land is being subdivided into five and ten acre tracts.

Schuebly Bros. of Chattaroy have purchased 160 acres, which in addition to the 1,100 acres they now own will be put on the market in 5 and 10-acre tracts as soon as it is irrigated.

The Klickitat & Simcoe Irrigation Company of North Yakima has filed plats which show that the company intends to irrigate 7,000 to 10,000 acres of land on the Yakima Indian reservation from the waste waters of the upper Klickitat river. The reservoir site is on Diamond creek.

The county commissioners of Whatcom county have passed an order establishing the Scheinader ditch and ordered the county engineer to make estimates and surveys. The ditch will be the largest ever built in Whatcom county and will be three miles long and 12 feet wide at its mouth. This is a drainage proposition. The land to be reclaimed is in the heart of a fine farming section but has never been developed because of the marshy condition of the soil.

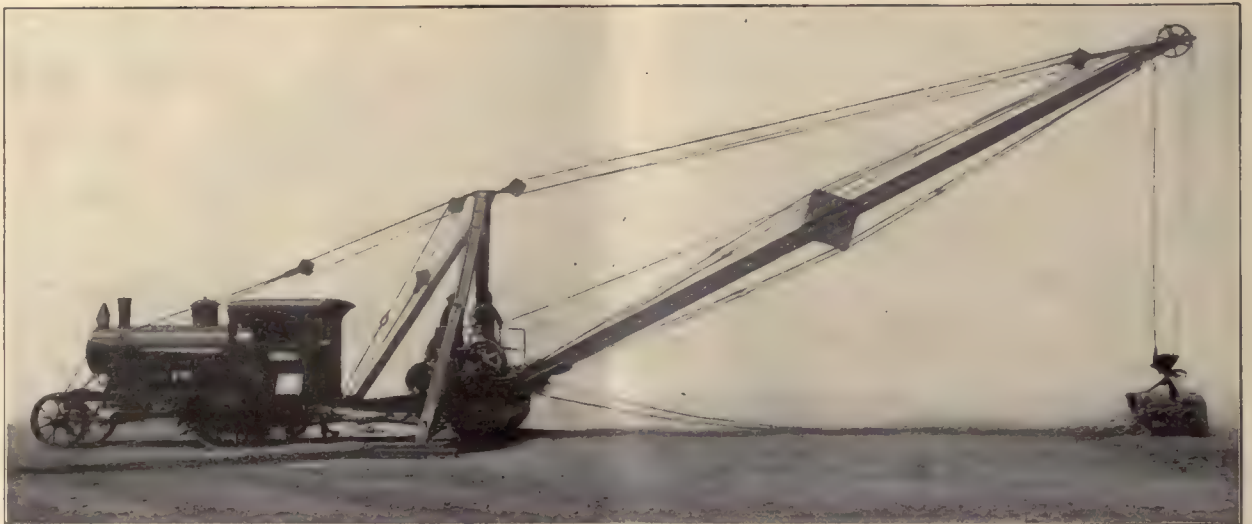
WYOMING.

Contracts for the construction of the ditches of the Uinta Land and Irrigation Company of Big Piney have been let and work will commence in the near future. Water will be taken from the Big Piney river to irrigate land lying between Muddy ridge and Green river and extending as far south as Meadow canon.

The Talmadge-Buntin Land Company, of Chicago, have taken over the forfeited contracts of the Wyoming Central Irrigation Company to construct an irrigation system for the reclamation of 400,000 acres of land in the

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Avery Company, Manufacturers, 965 Iowa St., Peoria, Ill.

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ceded portion of the Wind river reservation. They will not make a formal contract, however, until the federal land available for reclamation under such a system has been segregated under the Carey act.

Articles of incorporation have been filed in the office of the secretary of state by the North Spring Creek Reservoir Company, with a capital stock of \$10,000. The object of the company is to construct a reservoir with which to store the flood waters of North Spring creek for irrigation purposes. The principal office of the company is at Saratoga and is in charge of John Swartz.

MISCELLANEOUS.

The Iowa Colony, which has 400 acres of land under cultivation in the Nueces valley near Cotulla, Texas, is preparing to enlarge the capacity of its pumping and irrigating plant so as to furnish water for irrigating several hundred more acres. The colony owns 23,000 acres of land.

Judge Grimes of the district court of Scottsbluff, Nebraska, has dissolved the temporary injunction secured by the Gering Irrigation district against the State Board of Irrigation to prevent the board from closing the headgates of the irrigation ditches of the upper North Platte river.

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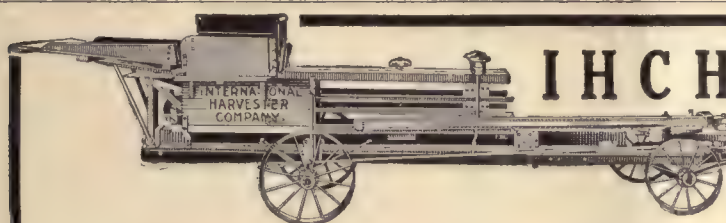
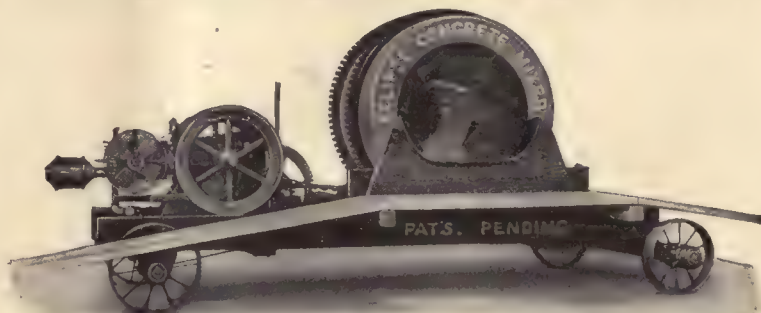
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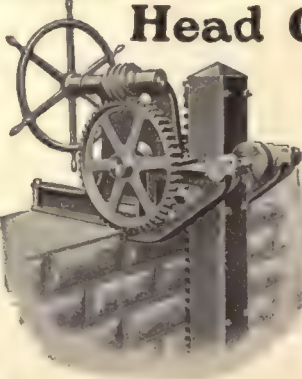
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I. J. Bailey and Samuel Coggin, who own a large tract of land near Brownwood, Texas, have installed a pumping plant from which they will irrigate their crops.

The Florida Mesa irrigation district's bonds amounting to \$1,060,000 have been purchased by the Rudolph Kleybolte Company of New York, Cincinnati and Chicago. The Florida Mesa irrigation district comprises 25,000 acres of land lying southeast of Durango, Colorado.

The people of Lubbock, Texas, are interested in a movement to install irrigation plants in that section. A test well will be sunk and if the water supply is adequate a central station will be built.

Sixty thousand acres of land in the Lafourche parish near New Orleans have been sold by the Golden Ranch Sugar and Cattle Company to St. Louis and Detroit capitalists for \$600,000. The tract is to be settled by farmers from Holland and the Netherlands.

Lands totaling 1,737,000 acres in California and Nevada will be opened to settlement on November 21st and to entry one month later. The lands were withdrawn for the Truckee-Carson irrigation project but have been restored because they are not easily irrigable.

R. T. Pruitt of San Antonio, Texas, has purchased 400 acres of land near Artesia, Texas. The land will be irrigated and planted to onions and canteloupes. The consideration was \$10,000.

P. & O. Engine Gang Plows.

The Parlin & Orendorff Co., Canton, Ill., are among the pioneer manufacturers of Engine Gang Plows, and for years have made a special study of the requirements in all sections. Their latest production in this line is the P. & O. Mogul, made with 5, 6, 8, 10 and 12 bottoms. A view of the Six-Furrow Mogul, to which is attached a P. & O. Disc Harrow, is shown on this page.

These plows are made in the most substantial manner, and the confidence which the Parlin & Orendorff Co. place in them is fully shown by their oft advertised statement that they "are backed by an unqualified guarantee." This guarantee, by the way, also covers everything

Ambursen Hydraulic Construction Co.

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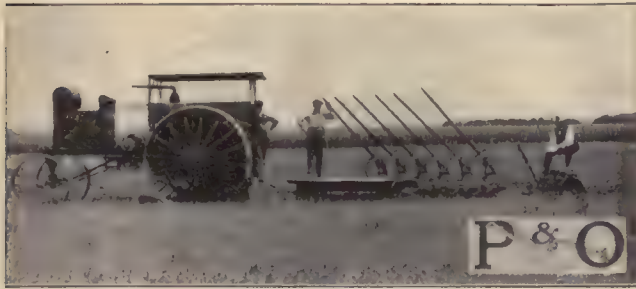
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We specialize on high dams and dams on difficult foundations. Our experience is based on the construction of 56 dams to date.

At the present writing, May 21st, we have under construction eight dams as follows:

A dam 45 ft. high and 700 ft. long in Newfoundland; a dam 48 ft. high and 900 ft. long in Georgia; a dam 48 ft. high and 470 ft. long in Wisconsin; two dams respectively 54 ft. high and 450 ft. long, and 60 ft. high and 550 ft. long in Minnesota; a dam 86 ft. high and 680 ft. long in Oregon and three smaller dams in Maryland, Indiana and Kentucky respectively. Seven of these dams include a power house in the bulkhead of the dam. The time of construction on each will be about eight months with the exception of the Oregon dam which will require about a year.

made by the P. & O. Co., which includes their entire line of plows, harrows, planters, cultivators, beet tools, potato diggers, etc.
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write to the Parlin & Orendorff Co. for their special catalog, "Traction Engine Plowing," which fully describes and illustrates the three distinct styles of engine gang plows made by them.

CORN HARVESTER with Binder Attachment cuts and throws in piles on harvester or winrow. Man and horse cuts and shocks equal with a corn binder. Sold in every state. Price \$20 with Binder Attachment. S. C. MONTGOMERY, of Texaline, Texas, writes: "The harvester has proven all you claim for it. With the assistance of one man cut and bound over 100 acres of Corn, Kafir Corn and Maise last year." Testimonials and catalog free, showing picture of harvester. New Process Mfg. Co. Salina, Kan.

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Whitewater Irrigation & Land Co., Denver. Capital Stock \$1,500,000. J. Albert Wright, Frank White, H. A. Gibson.

Inauguration Ditch Co., Delta. Capital Stock \$5,000. F. Benefill, President; A. S. Hill, Secretary.

The North Fort Morgan Reservoir & Irrigation Co., Fort Morgan. Capital Stock \$200,000.

Ephrata Irrigation Co., Wenatchee. Capital Stock \$60,000. George W. Stryker, E. M. Tupper and E. A. Wyman.

Park Irrigation & Development Co., Brewster. Capital Stock \$12,000. N. B. Nelson, U. E. Fries, Christ Starzmann and F. McLaughlin.

East Ellensburg Irrigation Co., Ellensburg. Capital Stock \$15,000. D. Kinkode, A. M. Wright, C. M. Flummerfelt, J. P. Becker and J. D. Mathews.

Upper Sunnyside Irrigation Company, Spokane. Capital Stock \$300,000. Oscar F. Greeley, Arthur Scroggins, et al.

Miscellaneous. Texaco Drilling & Irrigation Co., San Antonio, Texas. Capital Stock \$5,000. B. Neville, T. A. Tirado, H. B. Allen.

Alfalfa Irrigation Co., Altus, Okla. Capital Stock \$5,000. H. L. Hax of Olustee, Harvey J. Hooker, Altus, Okla.; John F. Scott, Carthage, Ill.



Reducing The Cost Of Plowing

by means of an I H C gasoline tractor is bringing thousands of dollars extra profit to farmers all over the country. Until recently, tilling the soil has been one of the most tedious, expensive, and time-consuming operations of farming.

To plow a square mile tract requires turning a furrow eight miles long. To plow a square mile tract requires turning over 5,200 miles of furrow. On this basis figure out for yourself how many miles you walk in plowing your fields—how many miles your horses drag the heavy plow through the soil.

Then consider that a 20-horsepower I H C gasoline tractor will do the work of five teams with no expense for feeding—no time lost for resting—no expense for hired help—only a small cost for gasoline.

Remember that horses are an expense whether they are working or not—the present cost of corn, oats, and hay is a big item. Good hired men to care for and drive the horses are hard to get and must be paid good wages.

You can stop this expense and increase your profits by using an

I H C Gasoline Tractor

The I H C tractor is propelled by the famous I H C gasoline engine, which has been tested in every conceivable way in all kinds of service by the farmers of this country and found to be the most efficient and convenient farm power. The truck construction is exceptionally strong, but light—similar to, but more simple than those used so successfully on steam tractors for many years. The method of power transmission permits the delivery of the largest possible per cent of power to the draw-bar—where it is needed.

The I H C gasoline tractor has many advantages over steam tractors. It can be operated by one man. You do not need to be an engineer to run one. You do not need the services of a fireman. There is no expense for a man and team to haul fuel and water. The I H C gasoline tractor can be used in many places where a heavy steam tractor would be impractical.

Only a Small Quantity of Gasoline is Used Compared with the Amount of Work Done

These are a few of the reasons why other farmers have chosen the I H C. It should be your choice if you want the most efficient power for plowing, hauling heavy loads, operating threshers, etc.

See the I H C local dealer, or, write direct for catalogue and full particulars to nearest branch house

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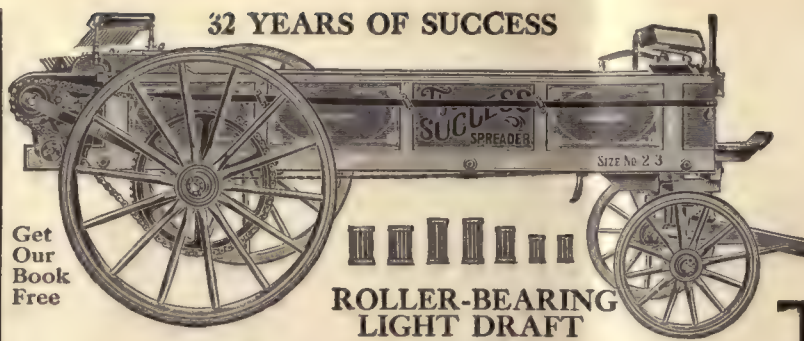
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Raising Crops



in the
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will make you independent.

The ambitious man or woman who wishes a home, friends, a comfortable living, and money in the banks to insure against future want, will find them in the San Joaquin Valley.

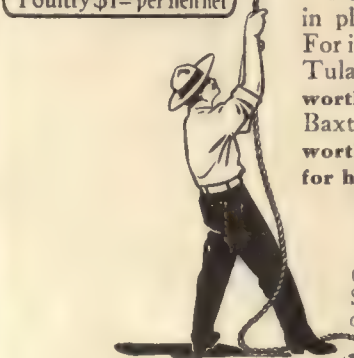
Here are 10,000,000 fertile acres, with an abundance of water for irrigation coming from the ever present snows of the High Sierras. The clear, warm California sunshine compels a sturdy, healthy plant growth. **Every staple crop is profitable here.** Nature is on your side. All that you need is reasonable industry and success is certain.

The man of small capital can get quick returns from vegetables, alfalfa, hogs, dairying and poultry, while the orchard and vineyard is coming into bearing.

Let me send you a 72-page book, telling in plain language what others are doing. For instance, it tells of Mr. S. W. Williams, Tulare, Cal., who last year sold **\$3,000 worth of milk from 30 cows**; of Mr. C. S. Baxter, Merced, Cal., who sold **\$7,200 worth of milk from 60 cows** and got **\$1,200 for his surplus alfalfa**.

Go to California this fall; only \$33 from Chicago, \$32 from St. Louis, \$25 from Missouri River, if you start any day, October 1 to 15. Tickets honored in Santa Fe Tourist sleepers on payment of berth rate. If you ask for it, I also will send you our journal, *The Earth*, free for six months.

Chas. L. Seagraves, Gen. Colonization Agent, A. T. & S. F. Ry. System, 1110 Railway Exchange, Chicago, Ill.



Alfalfa	\$50 acre
Oranges	\$300 acre
Peaches	\$150 acre
Grapes	\$100 acre
Vegetables	\$250 acre
Dairy	\$100 acre
Figs	\$125 acre
Poultry	\$1.00 per hen net

"THE VALLEY OF CONTENT."

THERE is now in press a little 16-page booklet on the Valley of Content that is about the most comprehensive piece of advertising matter ever put out in behalf of any district or section.

"The Arkansas Valley—300 Miles of Opportunity: It Is the Valley of Content."

That is the title given to the little book, and it is filled with statistics on the valley and with a recountal of its resources.

After a general introduction, the book tells of the half million acres under water in the Valley of Content; the 100,000 acres of alfalfa; the 70,000 acres of beets; the one county that raises a million dollars of fruit; the county that raises a million dollars worth of cantaloupes; and the county that has a 3-million dollar wheat crop this year.

The different towns in the valley, from Canon City to Garden City and Cimarron, are then taken up and tersely referred to as to their principal possessions and sources of pride. The names and officers of the various 22 commercial bodies are given, and there follows a short paragraph on each town, telling just what it needs most.

The book will be circulated by the thousands. The first edition will be 25,000 and it will be sent by the Arkansas Valley Commercial Association to the various local clubs for their use. It is felt that it will do a great deal toward attracting still further attention to the valley than has already been accomplished by means of the fact of the Eighteenth National Irrigation congress, Pueblo, September 26-30, and the National Irrigation exposition, Pueblo, September 19-October 1, being held in the valley this year.

Las Animas, which is to hold a big Santa Fe Trail celebration in a few weeks, wants the next meeting after that at Lamar.

TEXAS TO BE AT THE CONGRESS.

L. M. MARKHAM, director of exhibits for the National Irrigation exposition, to be held in connection with the Eighteenth National Irrigation congress, Pueblo, September 26-30, has most encouraging information from Texas with the view to organized representation from that state at the exposition.

A letter to Mr. Markham from R. N. Magill, secretary-manager of the Lower Rio Grande Valley Association, Brownsville, Texas, conveys the rather unique idea of organization for participation in not only the National Irrigation exposition but various other events of similar character.

Mr. Magill says the Lower Rio Grande Valley Association has just been organized, superceding the Lower Rio Grande Commercial Club. It embraces in membership all the leading land and irrigation companies of that valley, and its object is "the united, mutual boosting of the advantages and opportunities of this favored section, and the cooperation of all interests for the success of all," according to Mr. Magill's letter.



St. Mary-of-the-Woods

ST. MARY'S, VIGO COUNTY, INDIANA

For Young Women and Girls

Founded 1840. Incorporated 1846.
Empowered to confer collegiate degrees.

The happy home life, refined association, high standard of scholarship and success in developing the noblest type of Christian womanhood, has made St. Mary's a school of four generations. Mothers send their daughters, and daughters, *their* daughters. Eight buildings; steam and electricity; modern equipments.

Resident students—more than all others—require frequent and invigorating out-door exercise. The hundreds of acres at St. Mary-of-the-Woods afford ample space for horseback riding, boating, extensive golf links, tennis and archery courts, etc. New gymnasium with basket ball, running course and swimming pool, bowling alleys, etc.

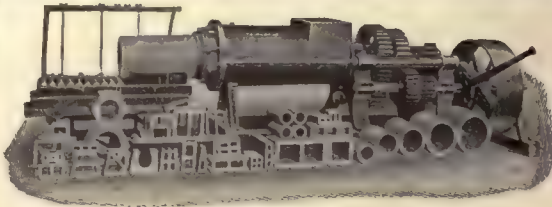
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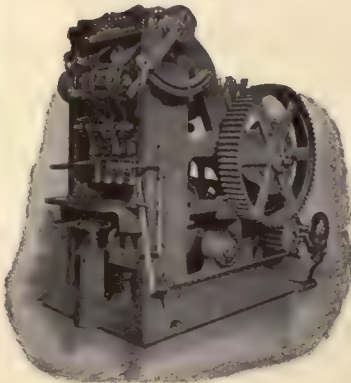




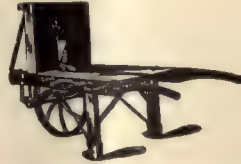
Centennial Auger Machine



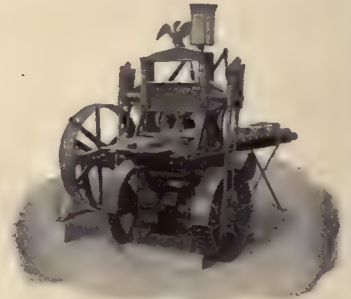
Mascot Auger Machine



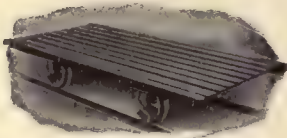
Dry Press, 5 styles



Wheelbarrows and Trucks



Eagle Repress



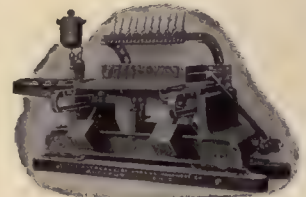
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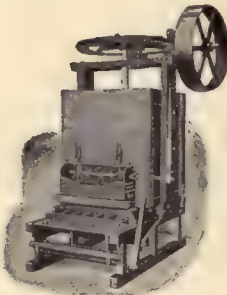
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We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

The American Clay
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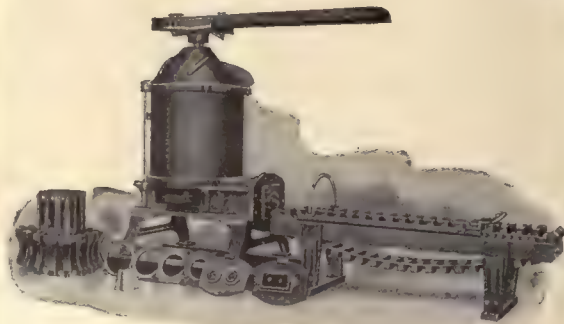
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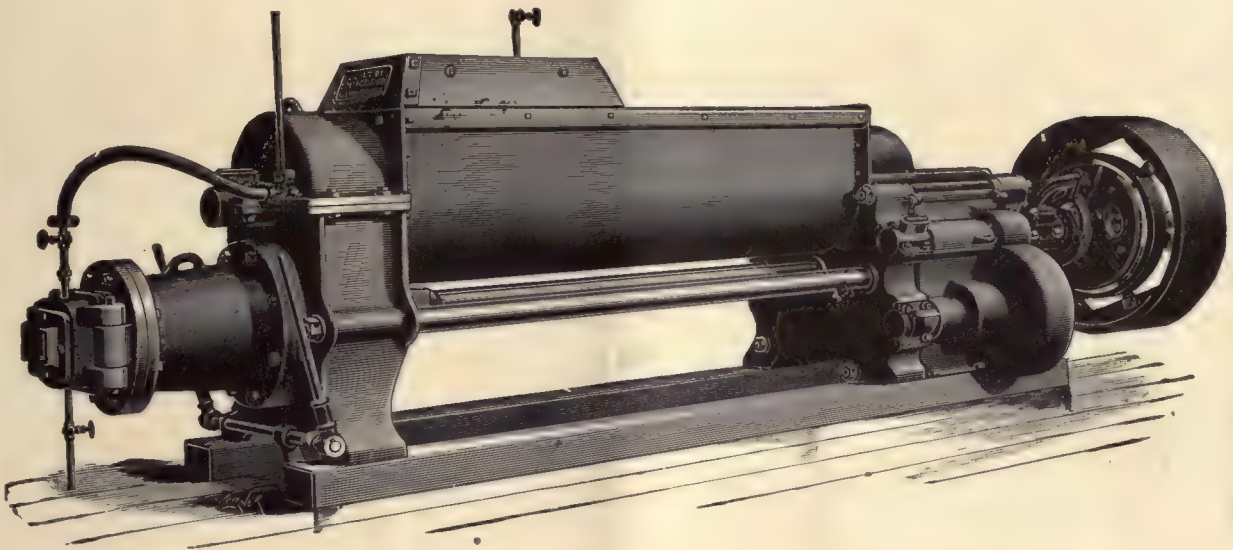


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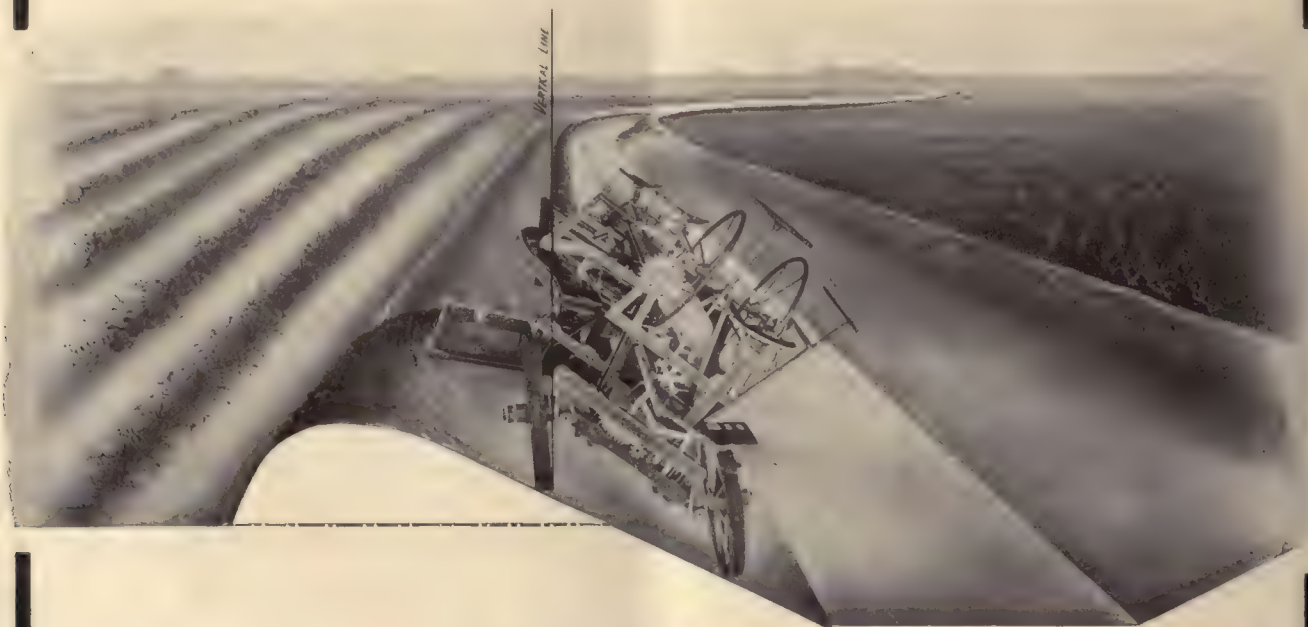
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THE RECLAMATION DITCHER

For Cutting Irrigation and Drainage
Ditches at the Least Cost



U. S. RECLAMATION DITCHER

This type of machine is different from all other ditching machinery, in that it plows the dirt out of the ditch with a continuous sweeping motion, whereas all other machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The cost therefore, per cubic yard, of excavating with the U. S. Reclamation Ditcher is necessarily much less than with any other tools or appliances.

The Reclamation Ditcher is adapted to cutting ditches as deep as three feet below the original surface and as wide as ten feet at the bottom and with sides sloped as steep as 2 to 1.

It has adjustable oblique wheels which perform the same function as the oblique wheels of a sulky plow. They are simply rolling landsides which counteract the side pressure of the earth on the mold and also make it possible for the machine to be operated on the sloping side of the ditch as shown in the cut.

It is universal in all of its adjustments and may be either used right or left hand. It is operated with twelve horses.

The difference in cost of cutting ditches with the Reclamation Ditcher and any other form of machinery is sufficient to pay for the machine very quickly. We absolutely guarantee this and will prove it to you by a demonstration of the machine on your own work before you accept it.

Write for descriptive folder which gives diagrams of ditches and cost estimates.

J. D. ADAMS & CO., Indianapolis, Indiana

Deep Well Working Heads



These Working Heads Can be Operated by Electric Motor, Gas or Gasoline Engine, Steam Engine or Belt Driven—the Motors and Engines being Direct Connected if Desired.

The chief advantage to the possessor of a Deming Deep Well Working Head is in the immense saving of power money in direct proportion to the great depths from which the water can be pumped.

Then, too, our working heads have differential or double acting cylinders—discharging water at each stroke. Anyone desirous of securing water from deep wells for private estates, farms, etc., could purchase one of the smaller sizes and use it to excellent advantage. Of course we make other larger sizes for irrigating—those in the illustrations having 24 inch stroke.

If you expect to install a private irrigating plant, or need a pump of any kind, we should be glad to have you write us, giving conditions under which the pump would have to work. Our engineering department would then give you full information.

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HAND AND POWER PUMPS FOR ALL USES

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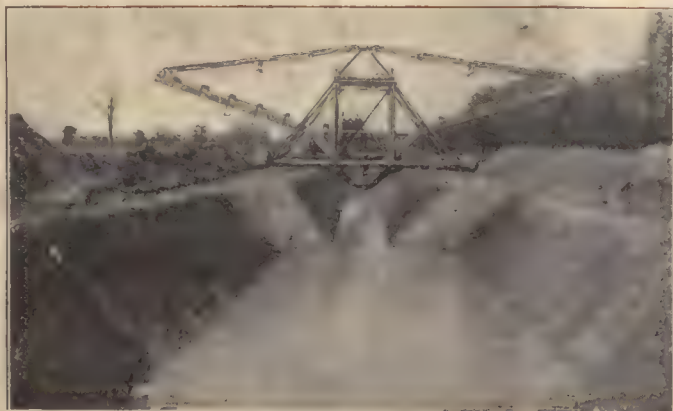
VOL. XXV

TITLE REGISTERED U.S. PATENT OFFICE

NO 12

CHICAGO, OCTOBER, 1910

A Ditch for Irrigation or Drainage



Ditch Being Dug with Sloping Banks—An Austin Drainage Excavator Ditch, showing variations in width made with same machine

is not merely an elongated pit filled with water—it is an open conduit. It is an engineering structure just as truly as is a railway. Its purpose is to transport water just as it is the purpose of a railway to transport merchandise. Like a railway, a drainage or an irrigation ditch must, to do its best work, be permanent and capable of transporting the maximum amount at the minimum cost. To meet this condition engineers have found that a ditch must be true to line and grade, have smooth sides and bottom, and have its banks sloped so as to prevent caving. This is the kind of ditch that the AUSTIN DRAINAGE EXCAVATOR digs to templet and in one operation.

OUR FULL LINE COMPRISES

The Austin Tile Ditcher
The Austin Levee Builder
The Austin Side Hill Ditcher

The Austin Highway Ditcher
The Austin Drainage Excavator
The Austin Orange Peel Ditcher

The Austin Drag Line Excavator
The Austin Rolling Platform Traction
The Austin Stump Puller and Grubber

We Sell Outright or Lease.

Send for our new complete Catalogue "S"

F. C. AUSTIN DRAINAGE EXCAVATOR CO.

Railway Exchange
CHICAGO, ILLINOIS

Morris Machine Works

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Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need.

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SCIENTIFIC IRRIGATION

Is the Only Irrigation that Nets Profits

You are not prepared to successfully meet Irrigation problems
until you have a

20th Century Grader

A 600 pound, one man, one or two team machine, constructed
of steel—strong and simple. Takes the place of several expensive
implements—has flanged wheels which prevent side draft



Cutting ditch 20 inches deep, 24 inches wide

TIME HAS PROVED THAT THIS MACHINE WILL

Slash off sage brush
Level fields for irrigation
Cut laterals for irrigation
Make shallow drainage ditches

Clean laterals and throw borders
Cut side ditches
Move dirt and drop it anywhere
Do the work of heavy graders at half the cost

And It Will Also
Withstand Hard Usage for Years

Thousands are in use and giving perfect satisfaction. Write for our
illustrated booklet containing irrigation information

Baker Mfg. Co., 726 Fisher Bldg., Chicago, Ill.

Twelve Rules to Help Automobile Buyers

With This Book You Can Absolutely Avoid Mistake in Buying a Motor Car

NO matter how much or how little you may plan to pay for an automobile, this book will help you.

It is an absolutely unprejudiced statement of plain facts that apply to all makes of cars, all sizes of cars, and all prices of cars.

Its advice is as plain as day.

And will be of immense benefit to you in reaching a decision as to what car is best suited to your particular needs.

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Send for a copy of "Twelve Rules" today; it costs you nothing, and may save you many dollars of expense and immeasurable disappointment and chagrin.

With it we will send information concerning the cars we are selling, because we want you to know about them.

But these "Twelve Rules" do not favor our cars.

Our cars must stand the test of merit, just like any other maker's car ought to do.

And all we ask, when you come to buy a car, is that you put Winton cars to the hardest possible test, and determine for yourself whether a Winton exactly suits your needs and your price, or not.

* * *

We offer for sale various models, ranging from our 1911 six-cylinder, 48 H. P. Winton Six, at \$3000, down to the four-cylinder Model K, 30 H. P., at \$700.

We realize that there are many buyers who hesitate to put as much as \$3000 into a new car.

But we want the trade of these buyers just the same.

So we have devised a plan where the man who doesn't want to spend \$3000 can still get a Winton car, and be in the class of high-grade buyers.

* * *

This is the plan:

Some of our buyers want a new car every year—in order to have the very latest style of body, the latest thing in fancy trimmings, and the like. These buyers turn over their used cars in part payment for new cars. In the past it has been our custom to sell these used cars to city buyers "just as they stand." But we have changed our policy—in order to get your trade.

* * *

We take these cars into our factory, replace worn parts, tune up the car to the top-notch running condition, revarnish the body (sometimes giving it an entirely new coat of paint) and offer this car to you at exactly what it costs us.

This policy puts you in possession of a high-grade car at an exceptionally low price and makes you an enthusiastic advertiser of Winton cars.

* * *

And remember this: If you ever buy a Winton car from the Winton Motor Car. Co., and it is not exactly as represented, we give you your money back without bickering or delay.

YOUR MONEY BACK is something no other automobile maker offers. We make the propo-

sition because we know we have the best cars that skill and experience and facilities can produce.

* * *

Write us how much you plan to expend for a car (anywhere from \$700 to \$2000), and we will tell you what we can sell you at your price.

This involves no obligation on your part whatever.

We will describe the car in detail, tell you what it has in the way of top, glass front, speedometer, if any (some cars are sold without these equipments), and will make you a rock bottom price that will interest you.

* * *

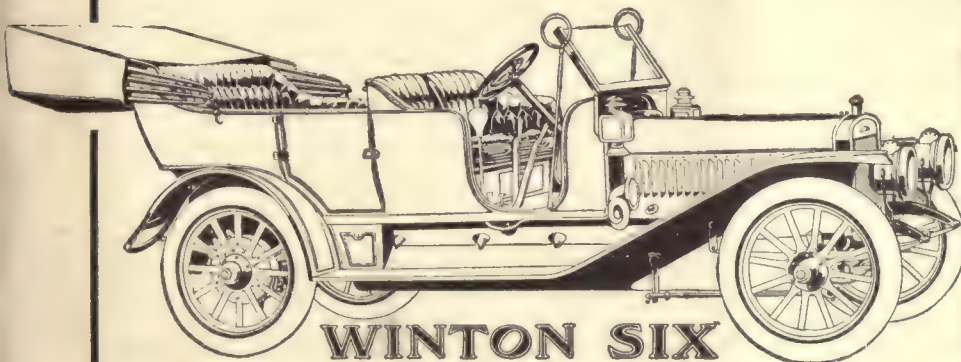
And note this: You are not obligated in any way. We never ship a car to a prospect and try to force him to take it when he has only asked for information.

The Winton Motor Car. Co., doesn't do business that way. If after we have told you exactly what we have, you decide to look the car over, we will arrange for a demonstration. Even then there is no obligation on your part. You needn't buy at all unless you are ready to buy and unless you are satisfied. And even if you do buy, remember we say:

"Your money back if the Winton car is not as we have represented it."

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Fill out the coupon and send it to us today. A copy of "Twelve Rules" will be sent free upon receipt of coupon giving us your name and address.



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The Winton Motor Car. Co.

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Send me information about one of your used cars selling at about \$..... This request involves no obligation whatever on my part. Send a free copy of "Twelve Rules to Help Automobile Buyers."

Ambursen Hydraulic Construction Company

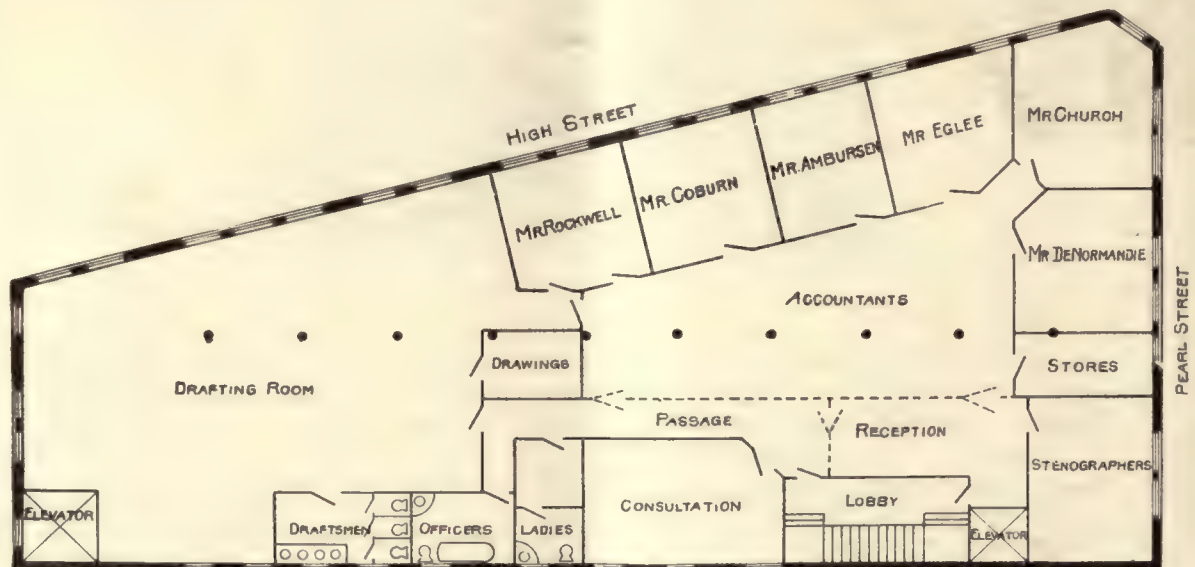
ENGINEER—CONSTRUCTORS

88 PEARL ST., BOSTON, MASS.

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Our business is the investigation, financing, engineering, construction and operation of Hydro-Electric Developments, and Irrigation Reclamation, including secondary irrigation by pumping, a feature which under right conditions and proper engineering will double or treble the available area under the ditches.

We specialize on high dams and dams on difficult foundations. Our experience is based on the construction of fifty-nine dams to date.



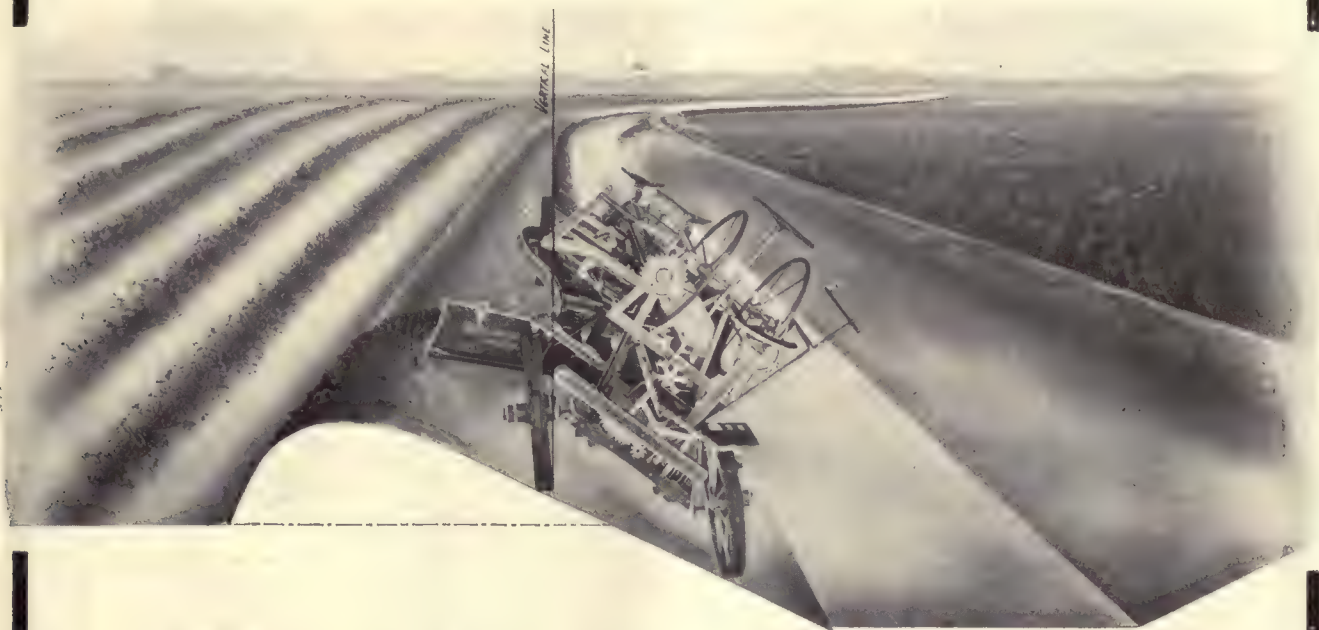
At the present writing, Sept. 22nd, we have under construction twelve dams ranging from 30 feet to 86 feet in height and from 450 feet to 820 feet long. Seven of these dams include a large power house in the bulkhead.

With one exception the time of construction will not exceed ten months from the date of signing the contract. The largest one will require about one year.

Send profile cross section at the site with general information as to the character of foundations and banks, available material such as crushed stone, gravel and sand, distance from nearest railroad, etc., and we will prepare preliminary plans and estimates.

THE RECLAMATION DITCHER

For Cutting Irrigation and Drainage
Ditches at the Least Cost



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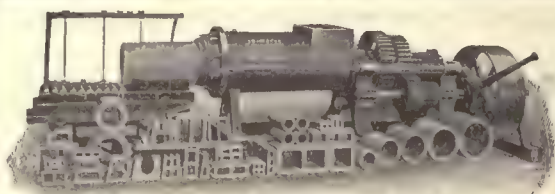
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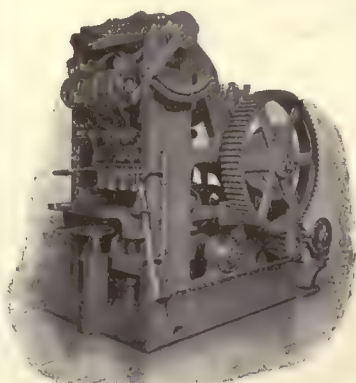
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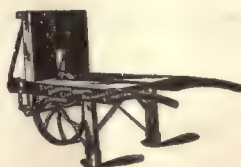
Centennial Auger Machine



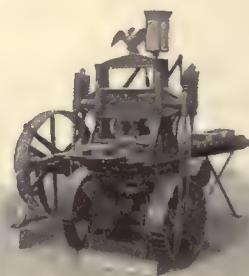
Mascot Auger Machine



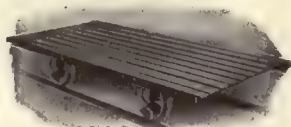
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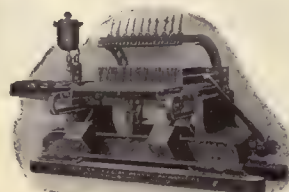
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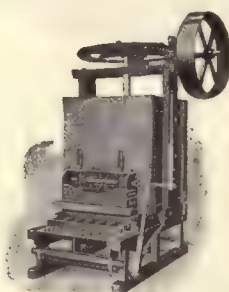
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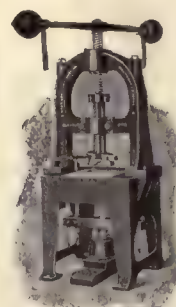
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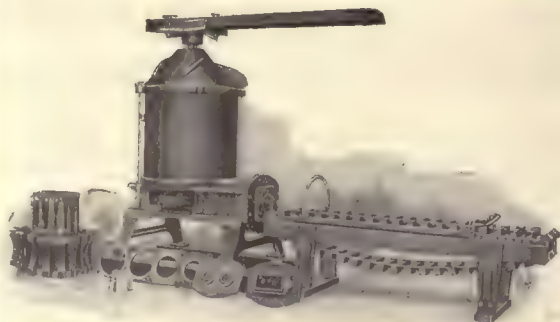
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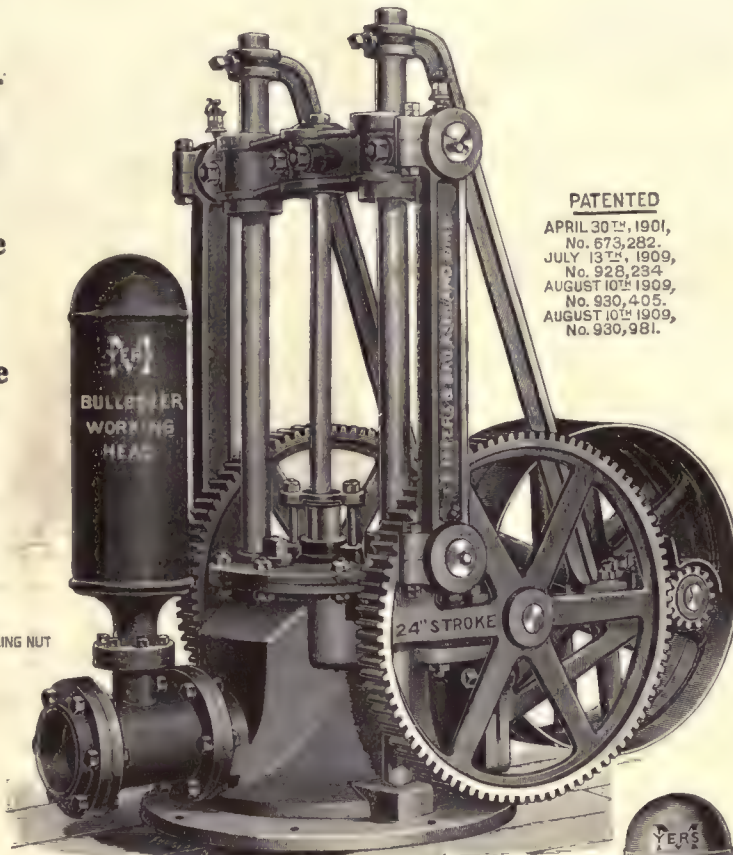
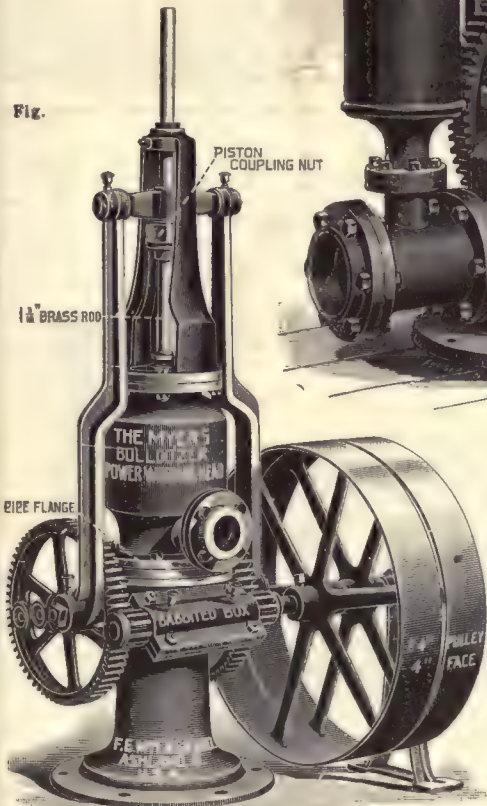
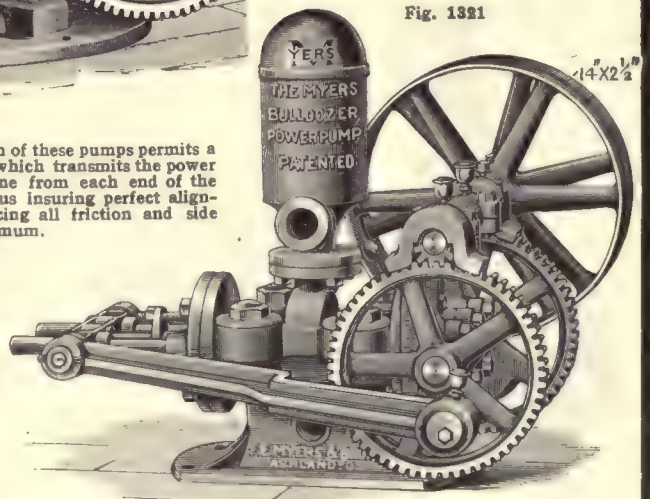


Fig. 1321

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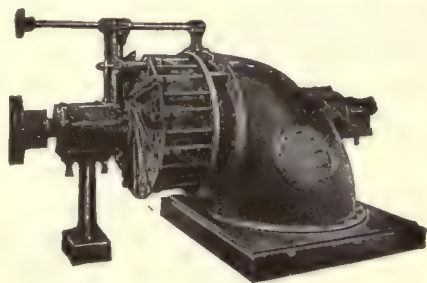
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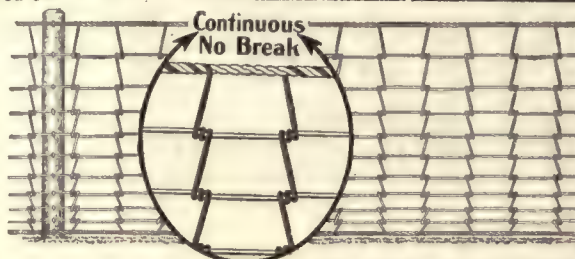
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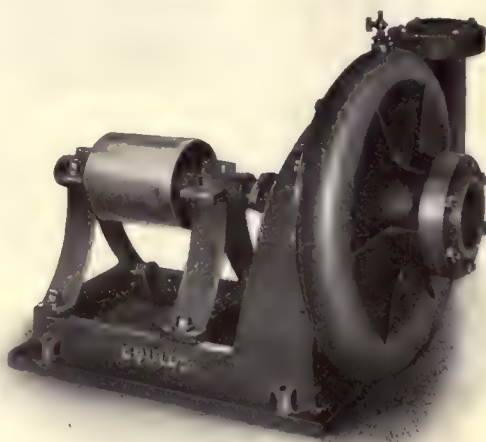
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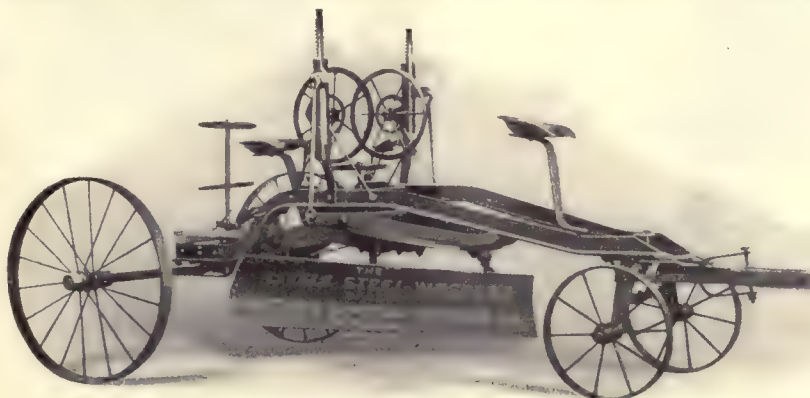
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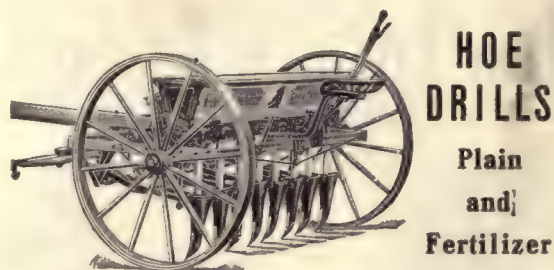
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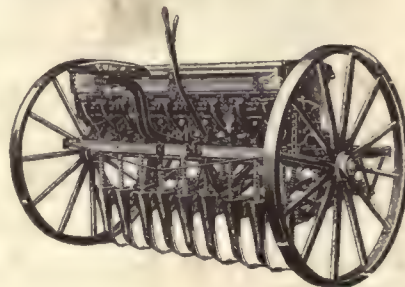
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VOL. XXV

CHICAGO, OCTOBER, 1910.

No. 12

THE IRRIGATION AGE

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THE IRRIGATION ERA
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THE DRAINAGE JOURNAL
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IRRIGATION AGE COMPANY,
PUBLISHERS,

112 Dearborn Street, CHICAGO

Entered as second-class matter October 3, 1897, at the
Postoffice at Chicago, Ill., under Act of March 3, 1879.

D. H. ANDERSON, Editor

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price,
\$2.00. If ordered in connection with subscription, the price is \$1.50.

Irrigation Congress Success Financially

The Irrigation Congress at Pueblo was in many ways wonderfully successful. Through the good work performed by the Local Board of Control with Mr. P. J. Dugan at the head, and Mr. R. H. Faxon as director of publicity, and Arthur Hooker as general secretary, a good attendance was obtained, and much valuable advertising was secured for Pueblo and the territory of which it is the logical business center. Pueblo has some immensely rich territory to draw from in the valleys extending in all directions from its center, and no doubt much greater commercial activity will come to its merchants as a result of this meeting. Pueblo contributed handsomely to the expenses of the congress, and while she was not so well supported from other sections of the state, put over a good show, and may rightfully feel proud of the results.

"Sunbursts" and Halos Diminishing Propositions

The Eighteenth National Irrigation Congress will go down in history as having entertained a larger number of "Sunbursts" along irrigation lines than has any of the past sessions. We had at Pueblo one or two from Spokane around whose heads, by close scrutiny, a reasonably distinct halo could be distinguished.

This is true of some other states. It is a strange fact that after two or three years' experience with the Congress, people from various sections of the country come to the meeting expecting to dominate and in the

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Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 25 years old and is the pioneer publication of its class in the world.

firm belief that they are divinely appointed conservators of both federal and private irrigation systems.

For the benefit of these "sunbursts" *THE IRRIGATION AGE* would suggest that there have been others before of their ilk who have gone down and been forgotten. Vanity-fed halos may properly be classed as diminishing propositions.

We Must Increase Production.

The average yield per acre of wheat in the last ten years was a little less than 14 bushels. For the preceding term of ten years it was only 12 bushels. With something of a curtailment in the crop of 1910, owing to drouth, we have about 100,000,000 bushels of wheat for export. The growth of population in America is rapid and we have all but reached the point where home consumption demands all the food-stuffs raised in this country.

Our exports to Europe have fallen off so heavily in the last few months that if it were not for the large cotton crop the balance of trade this year would be seriously against us. Such a condition is anything but satisfactory and it may be the forerunner of hard times.

The remedy is in better farming, so that instead of 14 bushels of wheat we shall harvest 30 bushels, and it is only by irrigation that such results can be attained. There is a great scare in this country over the scarcity of land, but as a matter of fact there are a million farmers who have twice as much land as they can work—fully twice as much as they ought to have. Our desire ought to be to get better results from the land which now is under culti-

vation. This has a more direct bearing on the prosperity of the United States.

We must increase our agricultural production on the land already in use. Our wheat crops should run from 30 to 40 bushels per acre, as they would under a general system of irrigation. Not only would crops be larger, but they would be regular with irrigation. A farmer planting 100 to 300 acres of grain would then know with reasonable certainty that he was going to have a crop, while at present the chances are against him.

These are not the only considerations, however. Suppose every farmer in the country got a yield of 14 bushels of wheat to the acre; that does not spell prosperity. That is barely the cost of production. The profits come after that. When the yield is 20 bushels there is some profit on large places, but there ought to be a production of 25 to 40 bushels as a regular thing, and then we could be able to boast of profitable farming and national prosperity. The scarcity of land and the growth of population would not trouble us much if we were putting such land as we now have to proper use.

Value Of the Land Shows.

It is with more than ordinary satisfaction that IRRIGATION AGE observes the growing interest in land shows. These exhibitions are educational in a broad way, and as such appeal to thinking men and women everywhere, who realize the importance of practical instruction in farming matters.

The great land show to be held in the Coliseum, Chicago, from November 19 to December 4 is a victory for IRRIGATION AGE, for it will serve to illustrate principles which this paper has for years been advocating. The same is true of the Pittsburg and Omaha land exhibitions. Irrigation will be the most interesting and important feature of each of these shows. There will be all kinds of machinery to view; all kinds of fruit, vegetables and grain. There will be state and neighborhood exhibits; whatever is new or valuable in farming will be shown, and many communities will be afforded an opportunity to set forth their advantages. Through it all there will be a note of progress, a spirit of endeavor and a sign of achievement. This endeavor, this progress and this achievement will center on the principle of irrigation, which this paper has fought for through evil and good report for nearly a quarter of a century.

One of the greatest needs of the day is a more intensified and diversified agriculture, in order that the United States may have a sufficiency of produce for the rapidly growing population and a larger surplus for export. The better farming that is so urgently required can only be secured through study. The practical application of scientific principles is the great need of agriculture, and this is being gained through education.

The value of irrigation is appreciated in the far west, but in the Middle West the need of an artificial water supply as an aid to farming is not generally understood or admitted. For three years in succession, however, the great dairy sections surrounding Chicago have suffered so seriously from drouth in mid-summer that the milk supply has been curtailed 50 per cent, and a new question has to be faced. Silos are being put up in great numbers in order that a supply of green fodder may be had in periods of drouth. Silos are excellent on all farms where cattle are kept, whether for dairy or beef purposes,

but silos will not cause grass and grain to grow. Irrigation is a necessity in the middle states just as much as in the newer sections. Whatever principle of agriculture will add 50 per cent to crop production is a good one to adopt. Irrigation will do this, and even more. A regular water supply is one of the first things demanded by the progressive farmer, and this can only be assured through irrigation. There are strong reasons, therefore, for holding land exhibitions in the central and even the eastern parts of the country. These shows stand for progress in the greatest of our industries.

Why Pay Secretary Three Thousand a Year?

If the Board of Governors of the National Irrigation Congress is to dominate every condition surrounding the meetings of that body, then it would be well to permit the delegates to remain at home and signify their desires by letter, addressed to the chairman of that board. This would save expense to the delegates and make it much more easy for the Board of Governors, who could meet in some secluded place and put over such resolutions and suggestions as would suit their fancy.

Another thought which comes up in connection with this is the matter of permanent secretary of the Board of Governors. This is a new arrangement which was planned by a politician in California who hoped to secure with it its accompanying salary; this schemer was discredited at the Spokane congress, and a local man, Mr. Arthur Hooker, stepped into the place which the Californian had prepared for himself. This position carries a salary, we believe, of \$3,000 per year. This is saddled upon the shoulders of the local board of control of the town in which the congress is held.

It is the first distinctive item in the consideration of expense in preparing for the congress. The money must be raised by the local board of control to carry on the congress. Many men have filled the position of secretary, heretofore, without compensation. Many have paid their own expenses, performed the work willingly for the good of the cause, and this could have been done continuously had it not been for the change in plan.

It is the impression of IRRIGATION AGE that this salary question as associated with the secretary will be done away with. It is fair enough to pay a secretary of a congress of this character a salary sufficient to cover all actual expenses, which would not exceed, in any event, \$1,000.

Just why there should be a figurehead who looking over the heads of the local board does nothing more than sign official documents is more than we can understand.

Mr. Hooker, the present incumbent, is a man of high attainments, delightful personality and reasonable ability, but there have been numerous men who have filled the same position in former years of equally as good ability, who were glad to do the work for the good of the cause without compensation.

There have been congresses in past years where the accredited delegates listed in the neighborhood of 4,000. The congress at Pueblo showed about 800. Perhaps it requires more work to secure 800 delegates than 3,600 or 4,000. We doubt it.

This matter should be taken up at the next meeting of the congress and thoroughly discussed.

It is rather a delicate subject to handle by the city

who is given the honor of entertaining the congress, but it should be handled during the time of the Chicago meeting, and undoubtedly will.

**Facts
About
Land
Values.**

Within the past month an improved farm of 100 acres in the western part of Cook County has been sold for \$80 an acre. There are many other instances of land selling at from \$80 to \$100 an acre in the dairy belt of Northern Illinois, close to Chicago, the greatest produce market in the West. Any one seeking a farm today can secure one at these figures in Cook, Lake, Kane, Winnebago, or almost any other county of Illinois, one of the greatest of corn, live stock and dairy states.

A case is known to the writer in which a farmer, who thirty years ago took a homestead in Iowa, recently sold his land in the Hawkeye State at \$150 an acre and bought a place within thirty-five miles of Chicago for \$90 an acre.

The real estate records in almost any daily newspaper will show that improved farms are selling in the best parts of Illinois for from \$80 to \$125 an acre. This range of prices is lower than that prevailing in some of the newer agricultural districts of the West. The old states have fallen behind the times in farming matters and consequently land values are lower in Illinois and Indiana than in some of the irrigated sections of the far Western states.

Productive capacity and profit yielding govern the price of land, and in recent years reading people have learned that the irrigated farms of Colorado, Utah, Oregon, Washington and several other states yield from 50 to 300 per cent more than farms in the eastern half of the country. People can afford and are willing to pay more for land on which big crops are assured. Haphazard farming in the old and wealthy states explains the low price of land. Rural life is not on as high a level there as in the new regions. Progressive people in great numbers have moved West.

It was Bill Nye who said, during his travels, that the western half of the United States had more rivers and less water, and more cows and less milk than any place in the universe. The late Robert Ingersoll is credited with saying that all the western lands needed was "society and water." The water was there. The inventive genius of man has found the way to use it. Society of the best type has followed. The humorist has found subjects elsewhere. Today western lands are claiming important space in the news columns of the metropolitan press. The wealthy, progressive man wishes irrigated land and naturally he turns to the West for it.

While there is no compilation of figures showing the employment of private capital in irrigation projects, extensive investigation shows that individuals and land companies have led the government, so to speak, in this class of investment. This condition not only prevails throughout the United States, but in almost every country where arid lands are irrigated.

Forty years ago, about 20,000 acres were under irrigation in the United States, and during the following decade the acreage was increased to 1,000,000. This was increased to 3,631,000 in 1889 and to 9,000,000 in 1902, and the latest reports available show 16,000,000 acres, or 24 per cent of the land under irrigation throughout the world, which totals approximately 75,000,000 acres.

**Were Heney
and Pinchot
Accredited
Delegates?**

In our report of the Eighteenth National Irrigation Congress it will be noted that Francis J. Heney of San Francisco, who delivered a talk before the Congress on Federal Control, Conservation, etc., took part in the deliberations later on, and submitted an amendment to the resolution offered by the Committee on Permanent Organization, substituting the name of B. A. Fowler, of Phoenix, Arizona, for president, in place of Col. R. E. Twitchell, of New Mexico.

It is to be presumed that Mr. Heney was a duly accredited delegate to the Eighteenth National Irrigation Congress. It would do no harm, however, to learn definitely that such is the fact, as in case Mr. Heney was not appointed he had no right to take part in the deliberations of the congress further than to deliver an address as indicated on the program.

It is very clear to those who have studied the actions of the different factions of the congress during the past few years that this effort to depose Mr. Twitchell in favor of Mr. Fowler was framed up after the arrival of Gifford Pinchot and Francis J. Heney, and, no doubt, at the instigation and suggestion of Mr. Fowler and his close friends. The fact of the matter is that Mr. Fowler as president of the congress was purely and simply an accident. He was elected to succeed the editor of this journal as secretary at the Sacramento meeting, at the suggestion of such men as Pinchot, Newell and their cohorts, and had no logical right to the nomination or election as president of the congress; it has been an established rule to select the first vice-president of the congress as president, and this rule has never been changed, so far as our recollections go, excepting in the cases of Hon. Thomas Walsh and Hon. Wm. A. Clarke, of Montana, both of whom as large contributors to the expenses of the congress, were conceded the honor of a second nomination and election. Hence, we say that Mr. Fowler, never having occupied the position of first vice-president, had no right in the first place to aspire to that position.

It would have been considered preposterous on the part of any former secretary of the congress to go out and work for the office of president, and it certainly would have been impossible for Mr. Fowler to obtain this position through any other chance than connivance with the powers that were temporarily (perhaps unlawfully) in control of the situation during the closing hours.

One can readily understand why Heney, being in sympathy with some of Pinchot's views, could be induced to carry out his wishes in a matter of this kind, and there is no question of his right to do so, provided he was a regularly appointed delegate to the congress. It is the opinion of THE IRRIGATION AGE that were he not a delegate there is some question as to the constitutionality of the vote in favor of Fowler. This is a matter that would be better determined by men who are acquainted with parliamentary rules and procedure.

Colonel Twitchell is, by odds, the brightest man in irrigation affairs in the southwest. He has never failed to perform his share of the work along irrigation development lines. He has written some of the best stuff that has ever appeared concerning prehistoric, present and future irrigation development through the southwest.

Mr. Fowler and his friends have not heard the last of this action.

The deposing of a man does not necessarily unmake nor is the elevation of a man, through connivance, an indication of his greatness.

Mr. Fowler is a man of pleasing personality—he is suave—a good talker, and, perhaps, a good politician. He must have some strength in his own community and state, otherwise he would not have been recognized and honored by selection as president of various organizations, nor would he have been taken into the reclamation fold in connection with the Roosevelt dam and Salt River development work.

In conclusion, it is the opinion of the AGE that the selection of Mr. Fowler as president of the Nineteenth Congress will be his undoing. No fair minded man can understand the moves made at Pueblo and retain full respect for the individuals interested.

It is unnecessary here to go into the insinuations and methods used by this coterie to defeat Col. Twitchell. The fact remains that he is the brighter man of the two and is a man that no combination can permanently down.

THE VALLEY OF CONTENT.

THERE is a charm to the name which has been applied to the Arkansas Valley in Prowers County, Colo. The title above given, "The Valley of Content," means a great deal to the man looking for a home and who has been induced to consider Colorado in his investigation.

The development of the valley from present indications is beyond the ordinary, and the reasons for it are not far to seek. The people in Prowers county are proud of the irrigation systems which have brought the lands into prominence. It is doubtful if any irrigation canals in the state are in better shape or have a warmer public endorsement than the Fort Lyon and Amity Canals. While these were originally separate systems, they have been combined in a way to make them unusually strong and with a water supply that is unquestioned as to priority and abundant in the amount furnished.

The Arkansas Valley is coming into prominence for several reasons. These reasons are, one might say, purely agricultural. The alfalfa crops are beyond the belief of the man who has never looked over an irrigated country, and the end is not yet. Every man who is buying land in that valley under the ditches above mentioned, is planning to grow more alfalfa, and the day is not far distant when the vivid green of alfalfa will prevail as far as the eye can reach. At the present writing, the green fields are dotted until they appear like a prairie dog village, the stacks are so numerous.

Another factor in the development is the feeding of sheep, which is done in connection with alfalfa, or rather, it affords a market for the alfalfa. It is easy to see that one can ship alfalfa more easily in the form of mutton than when baled. The estimate is that over 200,000 sheep were fed in the vicinity of Lamar and Holly during the winter of 1909-10, and calculations are being made for even greater feeding this coming season.

Sugar beets form no small part of this agricultural progress and as the big farms are being rapidly divided up, this crop will be grown still further, and there are plenty of factories to take care of the product. There has been a change made in the matter of paying for the beets, and they are now more profitable than formerly, because instead of a flat rate of \$5.00 per ton, they are getting higher prices if the beets show over 15 per cent sugar content. With each additional per cent above 15, 25 cents per ton is added to the price. Last year at the Holly factory as high as 22.8 per cent was found in some of the beets. The last summer having been unusually hot, the chances are that there will be large prices paid for the beets.

The growing of small grain, particularly wheat, is also a source of much profit. This year, there are no reports of less than 40 bushels to the acre, running from that up to nearly 70 bushels. The mill at Lamar with a capacity of 500 barrels of flour per day, consumes most of the local crop.

In the vicinity of Holly where there are many farms of 40 acres, the tendency is toward truck farming, fruits, vegetables of various sorts, and melons, and the Holly melons are beginning to assume as important a place in the eastern markets as the well-known Rocky Ford. In fact, there has been a premium on Holly melons during the season of 1910. When one begins to discuss the matter of truck farming, he gets into a territory that is both wide and deep, and the possibilities in this line are unlimited. So far, this work has been more or less experimental, but new blood is coming in and the new generation of farmers is developing these resources in a very profitable way. Seed growers are turning their attention also to that country in an effort to develop their seed business and to test their products. One man who has experimented more or less on vegetables, asserts that there is nothing grown in the same latitude anywhere in the world, but what will grow at Holly. Among other crops last season, he had less than a half acre, possibly a third, of sweet potatoes. They produced 86 bushels and sold for \$2.00 and \$2.50 per bushel.

The transportation facilities of the Arkansas Valley are apparently in advance of the country, and this will be



A Prowers County, Colo., Wheat Field, which Produces Sixty-six Bushel to the Acre.

a great factor in future settlement. The Santa Fe main line runs along the south side of the river through Prowers county, while a branch runs from Holly to Swink on the north side of the river. This branch was an independent road, but is now owned by the Santa Fe, and a dozen embryo towns are being built and the indications are that there will be some thriving little cities along that line in the next few years.

It has been the history of irrigated countries elsewhere, that the towns develop rapidly in the vicinity of intensive agriculture, and there will be no exception in this valley. The efforts now being made along the line of colonization are toward the small farm not to exceed 80 acres, and as the readers of THE IRRIGATION AGE are well aware, the 80-acre farm is large enough for the intensive farmer and means much for the country and for the future of both town and state.

Send \$2.50 for The Irrigation Age, one year, and the Primer of Irrigation, a 260-page finely illustrated work for new beginners in irrigation.

Eighteenth National Irrigation Congress

The convention of the Eighteenth National Irrigation Congress at Pueblo, Colo., September 26 to 30, was an event of unusual importance to that city and the section of the country surrounding it. While the attendance was not as great as was anticipated, the number of accredited delegates being slightly over eight hundred, the general result was satisfactory to the people of Pueblo and, in a way, will result in much good to irrigation interests in that section particularly, and of more or less good to this industry through the western states.

As was anticipated, the congress was dominated by influences over which the ordinary delegate had no control. There were, to be sure, some new active spirits who became prominent in the meeting, and who performed good work. This was especially true of some of the Chicago delegates, and particularly so of Judge Charles C. Fishback, who acted as chairman of the Illinois delegation. There was a noticeable lack of the "old timers"

fort to put their best foot forward and make the finest showing possible.

The most startling feature of the entire congress, that which created the greatest excitement, was the overruling of the recommendation of the Committee on Permanent Organization in the case of Col. R. E. Twitchell for president.

It is a well known fact that Col. Twitchell was entitled to the election. It has been customary heretofore to carry out the wishes of the Permanent Organization Committee. After the fight was over which designated Chicago as the meeting place in 1911, Mr. Francis J. Heney, of California, offered a substitute for that part of the report of the Permanent Organization Committee, designating Col. R. E. Twitchell for president, and a keen fight resulted.

The substitute named, B. A. Fowler, of Arizona, acted as president of the congress last year, and was previously secretary of the congress. This astounding change in the plan of recognizing or ignoring the suggestion of the Permanent Organization Committee would not have been possible had the subject been taken up by any other than a man as prominent as Francis J. Heney. After a very close vote Mr. Fowler was selected by the adoption of Mr. Heney's amendment.

The discussion of this action in a general article concerning the congress would be out of place, but THE IRRIGATION AGE intends to handle the subject in another form in this as well as subsequent issues.

It may be well to explain that the move of Francis J. Heney, who moved an amendment to the report of the Permanent Organization Committee, substituting the name of B. A. Fowler, of Arizona, for Col. Twitchell, of New Mexico, appears to have been prearranged and deliberately planned. Mr. Heney deprecated the selection of officers by a small body of men and pled for more democracy and direct nominations. In other words, he made a move in the direction of changing the whole former plan of the congress and the framing of a new constitution and by-laws.

THE IRRIGATION AGE is not sufficiently familiar with the



B. A. Fowler, President,
18th National Irrigation Congress.



Arthur Hooker, Secretary,
18th National Irrigation Congress.

among the delegates, in fact not over one-eighth, could be classified as the active old time workers.

There was a fairly good attendance of foreign representatives, and each state in any way interested in irrigation or its branches, was fairly well represented.

The people of Pueblo are to be commended for the manner in which the preliminary work of the congress was conducted, and the Local Board of Control was easily the best organized and most competent organization of any congress so far. The Local Board of Control of Pueblo labored continuously under difficulties. In the first place it was difficult to raise funds with which to carry on the early work. Secondly, the counties of the state were slow to come forward with assistance and this required a tremendous amount of work, which rested entirely upon the local officials.

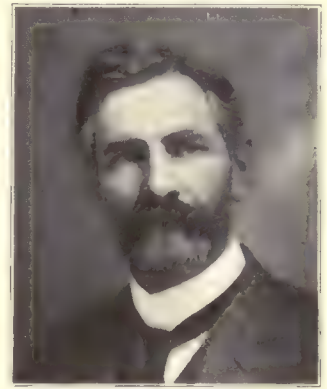
Pueblo was in gala attire, her streets beautifully decorated and the citizens of that city keenly alive to the honor which was paid it by its selection as a meeting place, did all in their power to make the stay of the delegates and other visitors pleasant.

A feature in connection with this congress which has never before been attempted was that of the National Irrigation Exposition, which was conducted by an auxiliary organization to the Local Board of Control, under the direction of Mr. L. M. Markham. Several blocks of ground were secured adjoining the Mineral Palace grounds, and on this tract were exhibited farm machinery of all descriptions, pumping machinery, and in other sections were displayed the exhibits of the products of the various sections of the state of Colorado.

This feature in connection with the Congress attracted wide attention and many visitors. Trophies were offered for the best exhibits along certain lines and this stimulated not only manufacturers but the ranchman and commercial organizations throughout the state to an ef-



Col. R. E. Twitchell, 1st Vice-Pres.
18th National Irrigation Congress.



R. Insinger, Chairman,
Board of Governors.

work of the Committee on Credentials to know whether or not Mr. Heney was a regularly appointed delegate. This is a subject which it would be well to investigate. If Mr. Heney was invited to deliver a talk on Conservation and Federal Control, carrying out that part of the program would be proper without his having been appointed a delegate. He, however, without credentials as a delegate, would certainly have no right to suggest a change in the constitution and by-laws of the organization.

A spirited fight was had in connection with this suggestion, and the result was that the name of B. A. Fowler was substituted for that of Col. R. E. Twitchell, which re-

sulted in the election of Mr. Fowler, as stated in previous lines.

We are presenting herewith the resolutions of the congress as submitted by the committee, which practically tells the story of the meeting.

Resolutions Adopted by the National Irrigation Congress

This eighteenth convention of the National Irrigation Congress now drawing to a close, made up of duly appointed delegates from all the states west of the one hundredth meridian, and several east of that line, has been notable for the fullness and freedom of discussion concerning every aspect of irrigation. Much of the discussion has reached planes both high and practical and well worthy of preservation in permanent form for guidance in the future. Accordingly, we the delegates here in session assembled, in the city of Pueblo, state of Colorado, on this 30th day of September, 1910, do hereby adopt the following declaration of principles and affirmation of policies and opinions:

Recognizing the waters of the country as the source of life and the basis of the habitability and productivity of the land, we hold that the waters belong to the people of the country, and that this right of the people in and to the waters is natural, inherent, inalienable and indefeasible.

Recognizing the necessity for administering this invaluable possession of the people by state and federal agencies, we deny the right of state or federal governments, or municipal authorities, to alienate or convey water by granting franchises for the use thereof in perpetuity, or without just compensation in the interest of the people.

Recognizing the interdependence of the various uses of the waters of the country, we hold that the primary uses are for drinking and domestic supply and for agriculture through irrigation or otherwise, in which water is consumed, and that the use for navigation and for power, in which water is not consumed, are secondary; and we hold that use of the water should be made with reference to all other uses for the public welfare in accordance with the principle of the greatest good to the greatest number for the longest time.

FAVOR FEDERAL CONTROL.

Accepting the fact that all parts of each drainage area are related and interdependent, we hold that each stream should be viewed and treated as a unit from its source to its mouth; and since the waters are essentially mobile and transitory, we hold that federal control is essential to the equitable distribution and utilization of the waters of interstate streams.

Since the better utilization of our waters for water supply, irrigation, navigation and power requires unification of the various administrative agencies of the government having charge of the federal regulation and control of water and waterways into a single agency, we request our representatives in the federal congress to take early action looking to the creation of an appropriate agency for this purpose; such agency to be empowered to co-operate with states.

Viewing purity of water supply as essential to the public health and general welfare, we urge on all municipal, state and federal authorities, and on individuals and corporations, constant vigilance and requisite action looking towards purifying and preventing contamination of the waters.

ENDORSE RECLAMATION SERVICE.

Recognizing the establishment of the United States reclamation service, largely through the efforts of this organization, as one of the important steps in the development of this country as a home for a great and growing people, we heartily favor the continuation and extension of the service, and we reaffirm our full confidence in the integrity and capability of the officers of this branch of the public service.

Re-affirming the conviction of the last congress as to the importance of irrigation by private enterprise, we note with gratification the response by the federal congress and the census bureau to our demand for complete statistics concerning irrigation, and we commend this subject to the consideration of future sessions of this congress.

Adhering to the principle of local self-government, we urge co-operation and organization for mutual benefit among irrigators, and advocate provision for irrigation districts by the legislatures of all states in which irrigation is practiced.

Recognizing the economic waste and menace to the public health connected with our vast areas of swamp and overflow lands, we request our representatives in the federal congress to take suitable action looking toward the reclamation of such lands under a policy corresponding with that of the reclamation of arid lands by irrigation under the reclamation service; such reclamation of swamp and overflow lands to be carried forward through co-operation between individual owners, states, and the federal government.

DEEP WATERWAY APPROVED.

Viewing adequate and economical transportation facilities as among the great and growing needs of the irrigable region, we approve the development of navigation throughout the rivers and lakes of the United States, in accordance with a comprehensive plan beginning with a deep waterway from the Great Lakes to the Gulf as the main artery of our inland waterway system, and extending to other natural waterways in the order of their magnitude and commercial importance.

Recognizing the close natural connection between forests and stream flow, especially throughout the irrigable region, we heartily commend the federal forest policy, and favor its continuance and extension; and we reaffirm our full confidence in the high integrity and exceptional intelligence of the past and present officers of the United States forest service.

Approving the progressive withdrawal of lands suitable for homesteads from the national forests, we hold that such withdrawals should

be made in the light of expert investigation showing that the agricultural value of such lands is paramount to their value both for forest and for stream protection.

We reiterate the declaration of the Irrigation congresses of 1907, 1908 and 1909 in favor of establishing national forests in the Southern Appalachian and White mountains, and direct the attention of our representatives in the federal congress to the bill for this purpose now awaiting final action at the next session of the Sixty-first congress.

We favor the enactment of laws by the states to regulate the cutting of timber on state and private lands, and laws reforming taxation on timber lands, cut over lands, and re-forested lands, to the end that the perpetuity of the forests may be assured and the flow of the streams be preserved.

It is the sense of this congress that in the federal control essential to the equitable utilization and distribution of interstate streams, recognition must be given to the rights of all citizens who have effected valid rights of appropriation.

We commend the work of the United States geological survey, and strongly recommend that more liberal appropriations be made by the federal congress and the legislatures of the states for co-operation in the prosecution of the work of the topographic and water resources branches of this bureau, including stream measurement.

We commend the irrigation investigations of the officers of the experiment stations of the United States department of agriculture and of the agricultural experiment stations and state engineering departments, and urge more liberal appropriations by the federal congress and by the states for the work and co-operation of these agencies and for the more general distribution of the reports and bulletins recording their operations and results.

Holding that the inclusion of public lands in irrigation districts organized under state irrigation district laws, will beneficially extend the operations of such districts and materially aid in the reclamation of arid lands, we recommend to the congress of the United States the enactment of a law authorizing the inclusion of such lands within such districts, with all the rights, liabilities and exemptions of lands in private ownership, under proper safeguards of the rights of the United States in its public lands.

It is the sense of this congress that federal and state departments in charge of reclamation and conservation work should make accessible to the press the legitimate news of such departments as their work develops, to the end that the people may be informed as rapidly and widely as possible on these important subjects.

We recommend that the president of this congress appoint a commission of five to make a systematic study of the irrigation laws of the various states and to recommend to the legislatures thereof uniform legislation relating to irrigation.

Since the Dry Farming Congress is working in the interest of scientific soil tillage and conservation of moisture in order to reclaim all possible arid land by saving and utilizing all the available water, this congress extends hearty wishes for the success of that organization, with the assurance that we appreciate the value of every step that will in any way result in placing a greater area of land under cultivation.

Since the expert knowledge of officers of the reclamation service has in the past been invaluable to the congress at large, and especially to the resolutions committee, we record our regret that this important branch of the public service was not more fully represented at the Eighteenth congress.

CONGRESS VOTES THANKS.

Resolved, That the Eighteenth National Irrigation Congress proffers its sincere thanks to the state of Colorado and the city of Pueblo, including both citizens and the commercial and other organizations, for the hearty welcome and generous hospitality extended to the members of this congress. We especially thank Gov. John F. Shafroth and Mayor A. L. Fugard for their active participation in the congress.

We express hearty appreciation and thanks to the governments represented at this congress by foreign delegates, including Austria, Hungary, Australia, British Columbia, Canada, Chile, Cuba, Germany, India, Mexico, Prussia and Russia.

Having no official organ representing this congress (except the official proceedings, necessarily delayed in appearance), we thank the press of the various states that has at all times given this congress liberal space for free publicity, and we especially thank the press of Pueblo and of Colorado in general, for publishing full proceedings of this Eighteenth congress.

OFFICERS COMMENDED.

We commend B. A. Fowler for his efficient work as president and his able and impartial conduct in the chair; and we commend Arthur Hooker for his untiring services as secretary of the congress.

We commend P. J. Dugan and R. H. Faxon, chairman and secretary, respectively, of the Board of Control, and their colleagues on the board, for their successful work in arranging for this congress.

We commend the Pueblo Choral Society, under the leadership of H. F. Gruendler, for the delightful music rendered at the congress.

We heartily thank the various railway companies and officials for their contributions toward the success of this congress.

We express our genuine pleasure and appreciation of the splendid irrigation exposition initiated by the Pueblo Board of Control, which exposition demonstrates forcibly the wealth of production under irrigation.

BUREAU OF MINES.

The United States Government has recently created a Bureau of Mines in the Department of the Interior, the law becoming effective July 1, 1910. The new bureau continues the work of the Technologic Branch of the United States Geological Survey, with the exception of the investigations of structural materials. The technologic bulletins, which the United States Geological Survey had in preparation, will be printed in the near future by the Bureau of Mines, and thereafter all investigations into mining will be under this bureau.

Notes on Practical Irrigation

D. H. Anderson

Plant Foods—Their Nature—Distribution and Effects in General.

There are four substances which are essential to all plant food; without them few plants could live, and what is surprising, they form a very large portion of every plant in one form or another. These substances are: Carbon, oxygen, hydrogen and nitrogen. We shall take them up in rotation and briefly explain their origin, nature and action.

Carbon.

Carbon is generally known under the form of coal, any kind of coal, but for experimental purposes it is usually wood charcoal that is considered the nearest approach to pure carbon, there being none except the diamond which can be called actually pure or crystallized carbon. As wood charcoal, it is derived from willow, pine box and several other woods, burned under cover so as to prevent free access of air, and its manufacture is of great commercial importance, kilns for its creation existing in thousands of places throughout the United States, where forests abound and wood is in plenty. It should be borne in mind that this carbon, or wood charcoal, is an essential element of the plant, inasmuch as it comes out of it by burning. Moreover, it is all manufactured in the plant, extracted as part of its food from the soil, or the air.

Heated in air, charcoal, or carbon, as we shall call it hereafter, burns with little flame, and is slowly consumed, leaving only a white ash, the rest of the carbon disappearing in the air. It is not lost, however, for by the burning it is converted into a gas which goes by the name of "carbonic acid," which ascends and mingles with the atmosphere, to be again absorbed by plants to manufacture more carbon, or, rather, a fresh supply of charcoal. This carbonic acid gas is deadly, speedily causing death if breathed.

Carbon is light and porous and floats on water, but plumbago or black lead, and the diamond, which are only other forms of carbon, are heavy and dense. Both black lead and the diamond, when burned in the air at a high temperature, leave only a very little white ash, the rest being converted into carbonic acid and disappearing in the air like the common charcoal.

Of this carbon, all vegetable substances contain a very large proportion. It forms from 40 to 50 per centum by weight of all parts of dried plants cultivated for the food of animals or man, and the part it performs in the economy of nature is therefore very important.

Light, porous charcoals possess several notable properties in plant culture:

First—They absorb into their pores large quantities of gaseous substances and vapors which exist in the atmosphere. Thus: They absorb over ninety times their bulk of ammonia; fifty-five times their bulk of sulphuretted hydrogen; nine times their bulk of oxygen; nearly twice their bulk of hydrogen, and absorb sufficient aqueous vapor to increase their weight from ten to twenty per centum.

Second—They separate from water, decayed animal matters and coloring substances which it may hold in solution. In the soil they absorb from rain, or flowing water, organized matters of various kinds, and yield them up to the plants growing near to contribute to their growth.

Third—They absorb disagreeable odors and keep animal and vegetable matter sweet when in contact with it. For which reason vegetable substances containing much water, like potatoes, turnips, etc., are better preserved by the aid of a quantity of charcoal.

Fourth—They extract from water a portion of the

saline substances, or salts, it may happen to have in solution, and allow it to escape in a less impure form. The decayed (half carbonized) roots of grass, which have been long subjected to irrigation, may act in one or all of these ways, or the more or less impure water with which they are irrigated, and thus gradually arrest and collect the materials fitted to promote the growth of the coming crop.

Oxygen.

We know oxygen only in its gaseous or aeriform state, although it may be liquefied and even converted into a solid form under the name of "liquid air." As a gas it is invisible and possesses neither color, taste nor smell. When inhaled in a pure state it is stimulating and exciting to the vital functions, but used in excess it causes death. Plants refuse to grow in pure oxygen gas and speedily perish.

It exists in the atmosphere in the proportion of 21 per centum of the bulk of the latter, and in this state and proportion it is necessary to the existence of animals and plants, and to permit combustion everywhere on the globe. The amount of it in water will surprise many readers, for every nine pounds of water contains eight pounds of oxygen. A knowledge of this fact will cause the full value of water as an essential to plant growth to be appreciated. Moreover, water possesses the power of absorbing still more oxygen from the atmosphere than it contains naturally. Thus, water will absorb from three and one-half to six and one-half parts of oxygen to one hundred parts of water. Rain, spring and river waters always contain an additional proportion of oxygen, which they have absorbed from the atmosphere. This is taken up in the soil, for, as the water trickles through the soil, it surrenders the oxygen to the plants with which it comes in contact, and ministers to their growth and nourishment in various ways to be hereafter explained.

But the quantity of oxygen stored in solid rocks is still more remarkable. Nearly one-half of the rocks which compose the crust of the earth, of every solid substance we see around us, of the soils which are daily cultivated, and much more than one-half of the weight of living plants and animals, consist of this elementary body, oxygen, known to us only as an invisible, imponderable, unperceivable gas.

Hydrogen.

Hydrogen is also known to us in the state of gas, and like oxygen is without color, taste or smell. It is unknown in a free or simple state, although chemists have succeeded in obtaining it in small quantities, and is not so abundant as either carbon or oxygen. It forms a small percentage of the weight of animal and vegetable substances, and constitutes only one-ninth of the weight of water. With the exception of coal and mineral oils, known as "hydro-carbons," it is not a constituent of any of the large mineral masses of the globe.

It does not support life, and animals and plants introduced into it speedily die. It is the lightest of all known substances, being fourteen and one-half times lighter than air. Water absorbs it in very small quantities, one hundred gallons of water taking up no more than one and one-half gallons of it.

Nitrogen.

This substance is likewise known only in a state of gas. It exists in the atmosphere in the proportion of 79 per centum of its entire bulk, and is without color, taste or smell. It is lighter than atmospheric air in the proportion of 97½ to 100, and is deadly in its pure state to both animals and plants. It is essential in the atmosphere we breathe, moderating the combustion which would ensue if the air were pure oxygen, and forms a part of many animal and some vegetable substances, but does not enter, except in small proportions, into mineral masses. It is less abundant than any of the so-called organic elements, but it performs certain most important functions in reference to the growth of plants. Spring and rain water absorb it as they do oxygen, from the atmosphere, and bear it in solution to the roots of plants, one hundred parts of water dissolving about one and one-half to four per centum of the gas.

Proportions of the Foregoing Elements in Plants.

Although the substances of plants are composed mainly of the above organic elements, they exist in very different proportions. This will appear from the following table of "dried" plants, taking one thousand parts by weight as the standard:

	Oats.	Cloverseed.	Grass, hay.	Peas.	Wheat.	Potatoes.
Carbon.....	507	494	458	465	455	441
Hydrogen.....	64	58	50	61	57	58
Oxygen.....	367	350	387	401	431	439
Nitrogen.....	22	70	15	42	34	12
Ash.....	40	28	90	31	23	50
	1,000	1,000	1,000	1,000	1,000	1,000

The above proportions are slightly variable, but the figures given represent nearly the relative weights in which these elementary elements enter into forms of vegetable matter. Herbaceous plants generally leave more ash; that is, inorganic matter, the wood of trees and the different parts of plants yielding unequal quantities.

How Organic Elements Combine to Form Plant Foods.

Carbon being a solid and insoluble in water, cannot be taken up through the pores of the roots of plants, the only parts with which it can come in contact. Hydrogen, in its simple state, forms no part of the food of plants because it does not exist in the atmosphere or in the soil in any appreciable quantities. Oxygen exists in the atmosphere in the gaseous state and may be inhaled by the leaves of plants. Nitrogen may be absorbed by the leaves of living plants, but in a quantity so small as to escape detection. Moreover, oxygen and nitrogen being soluble in water to a slight degree, may also be absorbed in small quantities along with the water taken in through the pores of the roots.

But this absorption by the plant is insufficient to maintain its life and growth. It must have a liberal supply of food in which the four elements specified form a large percentage. Now, this food can only be obtained, or manufactured, by the four organic elements entering into mutual combinations to form what are known as "chemical compounds." It is these chemical compounds which find their way into the interior of the plant, into its very substance, and then the plant grows and reaches maturity, provided these chemical combinations are continued during its period of existence.

It must be borne in mind that the atmosphere diffuses itself everywhere. It makes its way into every pore of the soil, carrying with it its oxygen, carbonic acid and other substances it may be charged with, to the dead vegetable matter and to every living root. Its action is double—playing among the leaves and branches, and fondling the roots by mingling with the soil. It is the workman, and its tools are its gases, and with them it manufactures out of the raw material it finds in the soil—that is, the silica, the sulphur and other inorganic substances, and the decayed organic matter—chemical combinations which the plant seizes, appropriates and digests.

Chemical Combinations.

When common table salt and water are mixed the salt dissolves and disappears. By evaporating the water it is possible to recover the salt in the same form and condition as it was at first. This is called a "mechanical combination," with which chemistry has nothing to do, and which would not, in the economy of nature, be sufficient as a plant food, although such combinations and solutions are absorbed by the plant—they do not feed it!

But when limestone is put into a kiln and burned it is changed into an entirely different substance, which is called "quicklime." The limestone is decomposed by the burning, the carbonic acid mixed with lime is driven off by the heat and lime remains.

So when sulphur is burned in the air it is all converted into a white vapor of an unpleasant odor, which is finally absorbed by the atmosphere and disappears. This is also a chemical decomposition, in which the sulphur is combined with the oxygen of the atmosphere.

To cite another illustration, it may be said that water itself is a chemical compound of the two elementary bodies, oxygen and hydrogen.

None of these latter are mixtures like the mixture of

salt and water, but elementary bodies united to form new substances, which, as has been said, are called "chemical compounds," and it is through these chemical combinations that all plants and fruits possess their various peculiarities.

The number of compounds which the four organic elements form with each other is practically unlimited, but of them a very few only minister to the growth and nourishment of plants. Of these water, carbonic acid, ammonia and nitric acid are the most important. These compounds we shall take up in their order, a knowledge of all of them being of essential importance in agriculture.

Water.

The following are the three qualities of water important to plant life:

First—A solvent power.

Second—An affinity for certain solid substances.

Third—An affinity for its own elements.

First—Water possesses the power of absorbing the several gases of which the atmosphere is composed, and carries them to the roots of plants whence they are taken into the circulation.

It dissolves many solid inorganic substances, earthy and saline, and conveys them in a fluid form to the roots of plants, which enables them to ascend with the sap. It also takes up substances of organic origin, such as portions of decayed animal and vegetable matter, and likewise brings them within reach of the roots.

When warm the solvent powers of water over solid substances is very much increased, a fact which accounts for the luxuriant vegetation in the tropical and semi-tropical regions, and in what are known as "warm soils."

Second—Water exhibits a remarkable affinity for solid substances. A familiar instance is mixing water with quicklime. The lime heats, cracks, swells and finally becomes a white powder. This is familiarly known as "slaking" lime. When thoroughly slaked, the lime will be found to be one-third heavier than before. Every three tons of lime, therefore, absorb one ton of water; hence, if four tons of slaked lime is put upon land one ton of water is also mixed with the soil.

Water has an affinity for clay, the hottest summer seldom robbing the clay of its water, enough being retained to keep wheat green and flourishing when plants on lighter soils are drooping and burning up.

An affinity for water causes vegetable matter to combine chemically with it, but in the case of a porous soil the water is merely "drunk in" mechanically and it is retained unchanged in the pores of the soil, whence it may be evaporated out, but not where there has been a chemical transformation. This is a fact that should be remembered in applying mixtures of vegetable matter to the soil by way of fertilization. A mere mechanical mixture is of little effect; there must be a chemical transformation provided for. And it should also not be forgotten that water itself is capable of a chemical change whereby its qualities are preserved and retained much longer, indeed, than if merely poured upon the soil as a mechanical attempt to assist plant growth.

Third—Water possesses an affinity for its own elements, and this fact exercises a material influence on the growth and production of all vegetable substances. In the interior of plants, as in animals, water undergoes continual decomposition and recombination. In its fluid state it finds its way into every vessel and every tissue. In this situation the water yields its oxygen to one portion of the plant and its hydrogen to another portion, wherever either is needed, and, in like manner, the oxygen and the hydrogen resume their combination as water and cling together until a new chemical change is needed. To comprehend this better the reader has only to observe the effects of water on his own system, for, as between plants and animals, the transmutations of oxygen and hydrogen, conveyed into the system by means of water, are practically identical.

Carbonic Acid.

Carbonic acid, as has been said, is the gas from burned charcoal, or carbon. It has an acid taste and smell, is soluble in water and reddens vegetable blues. Water dissolves more than its own bulk of this gas. It is only one-half heavier than atmospheric air, and is deadly in its effects. Yet it is the principal food of plants, being ab-

sorbed by the leaves and roots in large quantities, hence its presence in the atmosphere is necessary to plant growth, though the proportion is small.

Carbonic acid unites with potash, soda and lime, forming compounds known as "carbonates." Thus pearlash is carbonate of potash; the common soda of the shops is carbonate of soda, and limestone or chalk is carbonate of lime. The common carbonate of lime, in its various forms of chalk, limestone or marble, is insoluble in pure water, but it dissolves readily in water containing carbonic acid. We know that water absorbs a quantity of carbonic acid from the atmosphere, and hence as it trickles through the soils containing limestone, etc., it dissolves a portion of the earth and carries it in its progress to the roots of the plants, where the earthy solution is used directly or indirectly to promote vegetable growth.

As to its absorption by water, a reference to a common glass of soda water will be sufficient to make this clear.

Some plants manufacture their own acids out of the carbonic acid—distinctive acids—for instance, oxalic acid, which is found in the leaves and stems of the common sorrel (*oxalis*). It is an acid not found in the soil and may be obtained from sugar, starch and even from wood by various chemical processes, principally by the use of nitric acid. To detail all the uses to which carbonic acid may be put would be going deep into chemistry, which is beyond the scope of this book.

Ammonia.

Ammonia is a compound of hydrogen and nitrogen, and performs a very important part in the process of vegetation. It promotes not only the rapidity and luxuriance of vegetation, but exercises a powerful control over the functions of vegetable life. It possesses several special properties which bear upon the preparation of plant food.

First—It has a powerful affinity for acid substances, and unites with them in the soil, forming saline compounds of "salts," which are more or less essential to vegetable life.

Second—It possesses a very strong affinity for the acids of potash, soda, lime and magnesia. When mixed with these acids the acid in the salt of ammonia (sal ammoniac), for instance, is taken up by the potash, etc., and the ammonia is set free in a gaseous state. This is the effect of lime dressing on a soil rich in animal and vegetable matter; it decomposes the salts, particularly those of ammonia.

Third—The salts which ammonia forms with the acids are all very soluble in water, and thus ammonia is brought down to the roots of plants for their use.

Fourth—In the state of carbonate it decomposes gypsum, forming carbonate of lime (chalk) and sulphate of ammonia, both of which are peculiarly favorable to vegetation.

Fifth—The presence of ammonia in a soil containing animal and vegetable matter in a decaying state causes this matter to attract oxygen from the air with great rapidity and in abundance, the result being that organic acid compounds are formed which combine with the ammonia to form ammoniacal salts. On the decomposition of these latter salts by the action of lime or other of the affinities above mentioned, the organic acids separated from them are always further advanced toward the state in which they become fit for plant foods.

Sixth—The most important property of ammonia is the ease with which its salts undergo decomposition, either in the air, in the soil or in the interior of plants, a peculiarity which is possessed by water, as has been said. In the interior of the plant ammonia separates into its constituent elements as freely as water. The hydrogen it contains in so large a quantity is always ready to separate itself from the nitrogen, and so, in concert with the other organic elements introduced into the plant through the roots or the leaves, it aids in producing the different solid bodies of which the several parts of the plant are made up. The nitrogen also becomes fixed—that is, "permanent" in the colored petals of the flowers, in the seeds and in other parts of the plant it passes off in the form of new compounds, in the insensible form of perspiration, or in perfumed exhalations of the plant.

(Continued on page 630.)

Pittsburgh Land Show Open 17th to 29th

By Sydney Wire

The Pittsburgh Land Show opened Monday, the 17th, and an enormous attendance is expected. The building, which is known as Duquesne Garden, will be gorgeously decorated for the occasion and the massed bands of the Pennsylvania State Militia and Naval Volunteers will furnish band concerts during the afternoon and evening. An excellent variety of exhibits have been secured by the committee of organization and train loads of fresh fruit and vegetable products are daily pouring into Pittsburgh and are being installed in the exhibition building. The state of Colorado, as well as that of California, will be suitably represented with large exhibits, while the industrial departments of a number of the larger transcontinental railroads are vieing with each other in an effort to surpass in the splendor and magnitude of their respective exhibits. A great deal of attention is being paid to the educational department of the show and an auditorium has been set aside for the presentation of stereopticon views and moving pictures and for the delivery of special lectures, which will cover a multitude of subjects pertaining to the land and which will be delivered by government lecturers who will be sent from Washington for that purpose. The Pittsburgh Land Show will have another feature which is creating a vast amount of national interest and which will probably bring to a conclusion the controversy referring to the ultimate location of the World's Panama Exposition to be held in 1915 in honor of the inaugural and opening of the navigable passage which will join the South Atlantic Ocean with the Pacific and which will materially change the present existing conditions of the world's maritime commerce. There is a heated discussion now progressing between the rival factions of Louisiana and California, and a powerful syndicate has been formed in the South which is headed by Gov. Jared Y. Sanders of Louisiana, who is supported by Mayor Bahrman of New Orleans and an influential faction of state officials and other well known people. The Louisiana forces will invade the East, making their congressional headquarters at the Pittsburgh Land Show, where they have secured five hundred square feet of space in which they will display photos and pictures of Louisiana, views of New Orleans and an interesting array of the semi-tropical plants of Louisiana with samples of corn, sugar cane, cotton, rice and tobacco, while a small army of notable speakers will accompany the delegation and a strong effort will be made to secure the votes and co-operation of the Philadelphia delegation in Congress. Among the official speakers for the World's Panama Exposition will be Gov. Jared Y. Sanders of Louisiana, Robert Glenk, Curator of the Louisiana State Museum and Chairman of the Committee of Exhibition and Sam Blum, Chairman of the Committee of Publicity. The Pittsburgh show is going to be a big one, and the entire community has been staggered by the inundation of billing matter and the wide reach of the publicity which has practically covered four of the most densely populated states in the Union. THE IRRIGATION AGE has secured space at the exposition and will be adequately represented with a suitable exhibit.

It is proposed to make the Pittsburgh Land Show an annual event and a number of the local papers are willingly offering their editorial co-operation. Any further information concerning the Pittsburgh show can be obtained by addressing the Administration Department at their offices at the Keystone Bank Building, Pittsburgh, Pa.

Send \$2.50 for the Irrigation Age 1 year, and cloth bound copy of the Primer of Irrigation

ARID AGRICULTURE

BY

B. C. BUFFUM, M. S.

Manager of the Wyoming Plant and Seed Breeding Company, Worland. Former Professor of Agriculture in the University of Wyoming and the Colorado Agricultural College, and Director of the Wyoming Agricultural Experiment Station.



PROF. B. C. BUFFUM.

For crops that must be worked with horses and machinery, it is not practical, as a rule, to make the banks over one and one-half to two and one-half feet high, as there is liable to be damage to farm machinery in crossing higher banks. If the side slopes of the banks are made slight, too much area is taken from the land that could otherwise be cropped. This system entails a large first cost and is also subject to the following disadvantages:—The top soil, usually the best, is removed to form the banks; even after leveling, the checks usually have

enough slope so that the water stands considerably deeper on the lower end of check than on the upper, which produces unevenness in the crop, some getting too much and some too little water. Considerable area is withdrawn from cultivation by the levees; it is hard to cross levees with heavy machinery. The great advantage is in the ease of irrigating and the large head of water that may be quickly applied and thoroughly controlled by the irrigator.

The "contour-check" method differs from the rectangular only in the way the levees are made. In this system surveys are made of level, or "contour" lines, spaced as far apart as it is practical to control the water when irrigating. This system may be used on steeper slopes than the preceding, in which case the checks are long and narrow and usually somewhat curved in outline, following the natural slope.

Natural Sub-irrigation.

This is a method that applies only where certain rather unusual conditions exist. These are: First, an impervious hardpan or rock stratum a short distance below the surface and parallel with it. Second, a shallow bed of gravel or coarse sand above this, through which water can seep easily from a ditch at the upper end of the field. Third, a rather fine soil not so deep, but that the water from the saturated gravel bed below may be drawn up to within a few inches of the surface, and not so shallow as to be unsuited to cultivation or to be kept too moist from the supply below. So many requirements have to be met that the natural conditions for the use of this method are rarely found, and the system is uncommon. But where the conditions are right perhaps no other practice is so advantageous and cheap. The ground does not have to be so accurately graded as in other methods—the irrigation ditches needed are only the main laterals, made deep enough to let the water they contain into the porous bed below—and little labor for irrigation is required. A further advantage is that level, clean culture may be practiced. Nearly all the advantages of the most expensive pipe sub-irrigation system are obtained, and almost without expense. Soils in which sub-soil is filled with free water are not suitable for deep rooted plants like alfalfa.

Sub-Irrigation by Pipes.

This is the most expensive and at the same time the most economical of water of all the irrigation methods. It is best, when putting in a system of this kind for orchards or other very valuable crops, to get the services of a competent irrigation engineer. The details of this

method are usually complicated and must be worked out for each farm.

The Basin Method.

This is a flooding system used almost exclusively for orchards. It is practiced more in California, perhaps, than in any other state, though it has superseded to a large extent the "check" method, which it very closely resembles. The principal difference between this and the check method of irrigation lies in the size of the checks, the basin containing only enough ground for one tree, while the check method used in orchards may contain ground on which several or even a great many trees are growing. The banks thrown up to retain the water in the basins are usually somewhat better constructed and more permanent than those in the "check" system. They are also usually much lower; as a less area is irrigated in a check. In some instances they are made so low that a cultivator may be run across them, by little lifting, without much damage to either the machine or the bank. It is commonly thought that, especially where the weather gets very hot, it is injurious to allow water to stand around the base of the trunks of fruit trees. Most farmers concur in the opinion that the heating of water in the basins by the sun will tend to scald the bark of the trees and that it may even produce wilting on hot days. To obviate this condition, usually a small mound is thrown up surrounding the trunk of the tree to prevent the water coming in contact with it. When this is done the water is applied where it is most needed, that is, not just at the base of the tree, but some little distance out and surrounding the tree. Under this area are the small roots that absorb water and feed the tree. Unless cultivation is practiced in the basins, where the ground contains much clay, it is apt to bake badly, and crack. These cracks may even extend through the banks and the basin may need some attention to keep it from leaking. The main objection to this method lies in the very large first cost of preparing the land. The actual labor of irrigating is very small, although it is necessary to let out the water from one basin when it has stood long enough and turn it into the next one, until all are irrigated.

Methods for Clay Soils.

The furrow method, or one of the sub-irrigation methods, is best suited to all heavy soils which are not so dense they will not absorb water readily, as there is more crusting of the surface and cracking when they are flooded. With the furrow methods it is also easy to mulch either the whole surface, or that part lying between the furrows. Seepage or percolation through the soil in the furrow method is aided by leaving the surface of the furrow rough, with clods in it, so that the water flows down slowly and has plenty of time to soak to the roots of the plants.

Methods for Sandy Soils.

On sandy soils, and especially on soils that are spotted with sandy or gravelly places, the flooding methods are usually more satisfactory than the furrow method. It is sometimes impossible to run a small stream of water in furrows through a loose sandy or gravelly soil, as it sinks into the soil almost as fast as it can be turned into the furrow. For short distances this may be satisfactory, but in general it is best on such soils to use a large head of water and flood the ground as rapidly as possible. The check method of flooding makes this kind of ground especially easy to work.

Methods for Steep Slopes.

The contour check method may be used on steep slopes. When the checks are made very narrow on this kind of ground, this method is called terracing. Furrows may be also used on moderately steep slopes, where they are run on grades only slightly below contour lines. Care must be taken with any method on steep ground, that the water does not get a start down the steepest slope, as it very quickly gathers force and volume and may cut the ground badly.

Methods for Slight Slopes.

For very level ground the check method is often found most advantageous. For slight slopes the furrow

method has some important advantages over the check. Ground sloping from four to ten feet to the mile can be easily irrigated by the check method, while ground sloping from ten to thirty feet to the mile is usually adapted to the furrow method.

IRRIGATION APPLIANCES.

**The Effect of Aridity Is to Stimulate the Thinking Machine
—He is Most Fortunate Who Can Readily Adapt
Himself to His Environment.**

Home-Made Appliances.

The farmer on irrigated land has, in many cases, either to adapt implements made for use in humid regions, to his own needs, or make new ones himself. He may have to invent implements for special purposes. More home-made appliances are found on the western irrigated farms than anywhere else. Many of these can be made quite cheaply and will serve the purpose as well as expensive tools bought from the manufacturers.

Sage Brush Grubbers.

The first work of the irrigator who has just settled on raw land is to get rid of the sage brush, grease-wood, or other bushes found on the land. Sage brush is not a deep or strong-rooted plant. The roots of grease-wood are large and very hard, but brittle. When the brush is small it is easy to get rid of it by plowing, perhaps putting on extra horses to pull the breaking plow, and following to pull out the uprooted brush by hand. Where the brush is larger this method may not do and one has to buy a sage brush grubber, made especially for the purpose, or find a substitute. There are two types of sage brush grubbers on the market. One of these has a horizontal blade so fitted on the frame that it can be held some two or three inches below the surface of the ground, thus cutting off the sage brush at its weakest point. A common road grader does good work where the brush is small, by merely scraping it off the surface. The other type of grubber has teeth which catches the brush as the machine is drawn along and pulls it out. This is a modification of the old revolving rake and the brush is dumped by tipping the machine over. This leaves strips of unpulled brush so the work must be done both ways.

For moderate-sized brush an expensive implement is not necessary, as a good grubber can be made of a discarded railroad iron. A straight rail may be used, but it is better to bend the rail in the center, so when horses are hitched to each end it will drag right side up, the front flange catching, breaking off, or pulling out the sage brush. From two to six horses on each end of the rail will be found necessary. It is usually best to make a platform back of the rail and weight it to keep the rail from riding over the brush or prevent a straight one from rolling. The flat bottom of the rail must be kept down to do the work. Where the brush is not too heavy a large area can be covered in a day, by the use of this device. For heavy sage brush, where the rail cannot be used, the only recourse is to use the mattock or grub-hoe and hand labor. With scattered or thin brush many think that hand labor is the cheapest way of clearing the land.

Brush Plows.

A heavy breaking plow is used with four to eight horses for the first plowing of sage brush or grease-wood land. Where many roots are encountered and the soil is hard and compact, the draft is heavy and plenty of pulling power is important. Three to five inches in depth is usually found best for breaking such ground the first year. After the first breaking it should again be plowed deeper. The mold-board plow is the best for sage brush soils, but a good disc will tear out small brush.

Ditch-Making Tools.

Irrigation ditches are of all sizes, and many types of implements are needed for different conditions. For small laterals no implement is better, perhaps, than the common lister. The ordinary mold board plow may be used for this purpose, being run back and forth and throw-

ing the earth away from the center of the ditch. For a slightly larger lateral the plow should be followed by an "A" or "Go-Devil." This may be home-made. By putting hinges on one side and a brace on the inside, the "A" may be adjusted to different widths of ditches. For larger laterals and small canals, the "slip" or the tongue scraper and the common grader are often used. For still larger canals there is no implement that can compare with the Fresno scraper.

Leveling Implements.

After having cleared the brush from the land and plowed it, the next question is leveling the land, or rather grading it so that it is of a uniform slope, suitable for irrigation. For land that contains many small humps and holes, some type of grade scraper is usually best for leveling. Where the knolls are large and the hollows deeper, a Fresno or "slip," or other scraper, may be used, according to the distance the earth must be hauled to level it off. The finishing touches should be made by the home-made leveler. This is a large frame made of 2x6 or 2x8 timbers, edges down, thoroughly braced, so that they will drag along the earth from the higher places and will deposit it in the lower places. The central cross-piece should be made adjustable by means of a lever, so that it may be lowered or raised. This, as well as the other cross-pieces, should be shod with iron. The adjustable scraper can be made to take off quite a slice from a high place, as the whole weight of the machine may be made to rest on its sharp edge. These levelers may be made 16 feet long and 5 feet wide for four horses, or 24 feet long and 5 or 6 feet wide, where eight horses are used.

Small Irrigation Tools.

The great implement used in the flooding method of irrigation is the common shovel, but there is a difference between shovels. The best irrigation shovel is one made



Sybilie Valley and Wheatland Canal, Wyoming.

strong at the waist, with a sharp point, and with the top of the blade bent over so that a rubber boot will not be cut when used to shove it in. In flooding from field ditches some kind of a lateral dam must be used. The practice of damming these laterals by means of earth thrown into them from the sides of the ditches, is not to be recommended, as it is apt to weaken the ditch banks and soon make holes in the farm. The canvas dam is easily made and is thoroughly reliable. A piece of canvas as wide, at least, as the ditch on which it is to be used, and some three or four feet long, should be tacked to a 2x4 scantling, or small pole, so that when rested across the top of the ditch, the canvas will lie in the bottom of the ditch up-stream. A little earth then thrown on the lower edge to hold it down, will make a strong dam. Perhaps no appliance is more essential than the canvas dam. Ten or twelve ounce canvas is the best weight to use. Semi-circular sheets of metal attached to a wooden

cross-piece are also used for this purpose. They are called tapoons, and in use the edge of the tapoon is shoved into the bed of the ditch, which the metal should be made to fit. Gates for allowing a part of the water to continue on down the lateral may be easily made in either the canvas dam or the metal tapoon. In this way the irrigation stream may be readily divided. In making banks for the check method of irrigation, the ground contained within each check should be made as level as possible, by means of a blade, or other scraper, the earth that is being scraped away being left at about the location of the bank. This bank can then be shaped up by a "ridger," which is the reverse of a home-made "A," the side not being allowed to meet at the point of the "A." This instrument drawn with the large end forward, shapes and straightens the bank. The places where the banks meet must be left unmade and these can afterward be filled in by hand or by a special machine made for this purpose, which is simply a scraper made so that its load can be easily dumped in one place. For furrow irrigation, a home-made instrument called a "marker," is used for making the furrows. It is simply a few 4x6 timbers, two or three feet long, bevelled at the lower edge and drawn along parallel to each other, being held the proper distance apart by a strong wooden frame. The front of the furrowing timbers should be slanted and shod with diamond-shaped sheets of iron. Furrows can also be made by special hoe teeth for a common cultivator. This leaves the furrows rough and loose. The furrows for beets and potatoes are usually made with a simple shovel plow, with or without wings, or with a small double or listing plow.

Head Gates.

Small head gates are necessary for each main lateral and sometimes a larger one for the ditch bringing the water to the individual farm. When water is plentiful and drain ditches are provided for carrying away the surplus, these gates do not have to be very carefully made, but in the end it always pays to make them well and so they may be easily adjusted to allow the amount of water required to flow down the ditch. For permanent gates on laterals heading in a large canal, iron head gates clamped to enough sewer pipe to carry the water through the canal bank are recommended, both because they are lasting and when once placed, there is less danger of a washout, which may cause greater damage or delay than there is with the ordinary wooden head gate. For the diversion of water into the different laterals on the farm, small wooden boxes with head-boards running between strips of wood tacked on the inside, are sufficient. Holes should be drilled through the handle of the gate so that it may be adjusted at any height by putting in a wooden pin at the proper hole. Sometimes trouble is caused by gates not thus held dropping down and causing the lateral to over-fill and flood all around it.

Drops.

Where the grade of a lateral is too great the water will soon cut in deeply and the result is that the lateral is too deep for easy irrigation. Such washed out ditches are unsightly and are objectionable on other accounts. To keep the water from running too swiftly when the natural grade is great, drops or spill boxes are necessary. These are simply little falls made by setting boxes into the canal. They should be so constructed that they will not wash out. Cutting around them is prevented by wing walls and boards placed vertically to keep water from starting through or around the box. A small board dam or apron, placed at the lower edge, prevents the eddies from undermining or carrying away the structure.

Culverts.

For carrying ditches across roads, railroads, other ditches, and the like, culverts made of pipe, are very suitable. Sometimes old boilers may be used for this purpose, but usually clay or cement sewer pipes are found preferable as they do not corrode. They should be carefully placed in line, the joints cemented and the earth tamped around them until solid. Where there is much alkali, unglazed clay pipe will only last a short time.

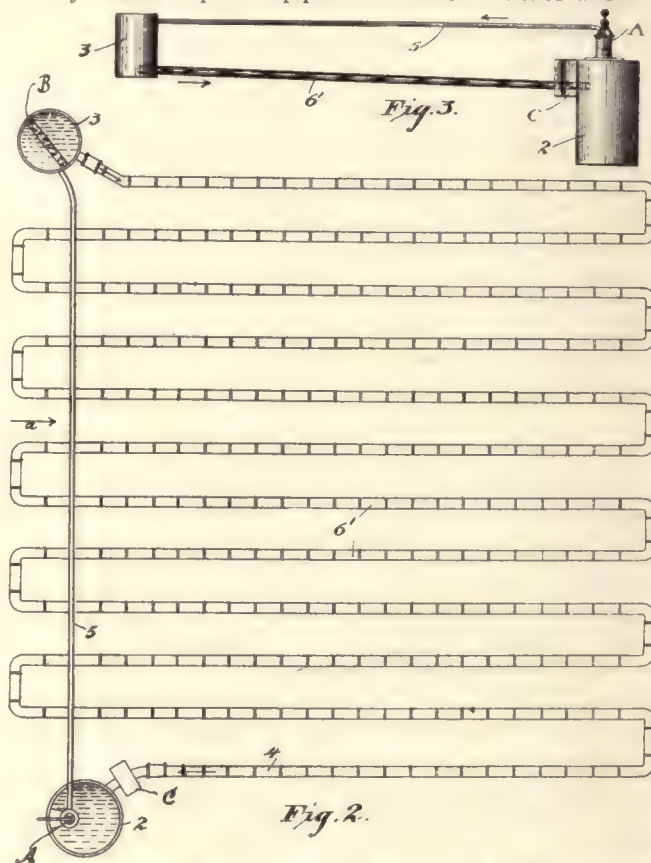
(Continued on page 629.)

SUB-IRRIGATION MADE EASY.

Problem Upon Which Governments Have Spent Large Sums Finally Solved By an American Engineer.

FOR years the various governments of the world have spent large sums of money in the attempt to solve the problem of sub-irrigation, one of the most important features of the development of arid lands, but it remained for an American citizen to finally discover the correct application of this vital principle. Mr. J. P. Hardin, of Oklahoma City, has produced a system of sub-irrigation which is meeting the demands of the farmers in the semi-arid countries as well as in those sections where the problem of getting water to very poor lands has heretofore prevented their development. His patents are controlled by himself and J. W. Thompson and the system is being introduced by the Success Realty Company, of Oklahoma City.

Sub-Irrigation by the Success Sub-Irrigation System, under Hardin patents, is the artificial application of water to land by means of porous pipes laid about 18 inches under



In the above cut 2 represents the well from which the water is forced into a reservoir or tank; 3 represents the tank; 4 is the return end of the tile through which the surplus water returns to its source; 5 is the pipe through which the water is forced from the well by some mechanical power into the receiving tank; 6 is the line of tiling; A is a force pump in well 2, by means of which water is pumped through pipe 5 into the reservoir or tank on opposite side form of the filter from which it enters tiling; B is a filter in center of tank 3; C is a filter into which surplus water flows from the return tile 4.

ground in rows 20 feet or more apart. By this system the ground is thoroughly moistened with less than one-fourth the amount of water which would be required by surface irrigation. Therefore the farmer who has only a limited water supply can irrigate his land by sub-irrigation as well as the farmer who has a river of water can irrigate his land by surface irrigation.

The cost of equipping a tract of land for sub-irrigation is much less than the ordinary expense of preparing it for surface irrigation, and millions of acres of land can be irrigated by sub-irrigation which could never secure water enough to operate a system of surface irrigation.

(Continued on page 617.)

APPLES AND ALFALFA

The following address on "Apples and Alfalfa" was delivered by Alva Adams at the National Farm Land congress in Chicago, November 19, 1909.

I take this subject as a text from which to preach a sermon upon rural life. "Back to the land" means independence and self respect for the individual and safety to the nation.

Every idle jobless man that shuffles along a city street becomes a menace to free government and a liability to the community. Every home builder, every man who by honest toil, provides for his family, is a positive asset, a true ashler in the fabric of the republic, for of such is the kingdom of liberty. To those who seek a new home—who would have their industry a guarantee for independence, I would make bright and fair the road that leads to Colorado. A land over which bends the bluest, clearest sky under which the flag of our country floats. There the air is sweetest, the sun is brightest. There men can live longer, have fewer annoyances and more natural delights. It is man's playground and God's hospital for His afflicted children. It is to be the seat of homes, schools, prosperity. There is gold in her trees—gold in her hills—gold in her soil. There are a hundred gates to her temple of resources—here eggs are not in one basket, but in many. So diversified are her assets that the bent of every honest, industrious man can be gratified. It is the state of destiny—the land of opportunity.

In some Eastern states there are more people than land. In Colorado there is more land than people. A sensible migration will help both. I will keep to the agricultural possibilities and not parade the other manifold resources of Colorado. The certain and opulent production of her irrigated fields and orchards should be attractive to those who have played the hazard of alternate drought and flood. Irrigation is the ideal method of agriculture. Next September the National Irrigation congress will hold its session at Pueblo. That convention will demonstrate the part that irrigation is doing and will do in horticultural and agricultural production. This exhibit will be a revelation to all who are interested in the food problem of the age.

The men who dug the first irrigation ditch in arid America was the Columbus of a new empire, not an empire of conquest of battle, fleets and armies, but an empire of homes. Was Brigham Young the father and prophet of irrigation in America? If so, he will be remembered for that work long after the church he founded in the wilderness shall have faded from the minds of men. Mormonism claims a larger percentage increase of converts in the past few years than any other church in America. The leaders of the Mormon church combine the material with the spiritual. Other churches promise a mansion in the next world; the Mormon not only meets this inducement, but he provides a home in this world also. Wise in human nature, the Mormon missionary recognizes the universal hunger for land and a home. They go to the landless, and homeless, and promise a piece of land where a home may be built, where apples and alfalfa and plenty may be produced; children reared and a family altar raised. This is an appeal of irresistible force. Any religion can make proselytes that offers with their faith land and a home to those whose environments forbids the possession of either. Were I bound to a hopeless struggle for existence, to a peon's toil without hope or outcome, I would accept any religion that offered me a vine and fig tree beneath whose shade I might sit and from whose fruit I might eat. Now and then a great spirit like Savonarola or Bruno will welcome the ax or the fagot rather than yield one line of their faith, but unfortunately the mass of mortals are first concerned as to bread and butter, and apple pie in this world. With this insured, they will take some chances as to the mansions, the fruit and pastures of Paradise.

I hold no brief either for or against the Mormon church and refer to its marvelous growth to illustrate the influence of land and home upon individual destiny. As to spiritual creed alone, it might have long since disappeared but it will continue to prosper as long as it can

provide material homes and work to those who embrace the faith. While the church can place its members upon an acre of land with the plow, the hoe and the water to cultivate it, converts will come and all the denunciation of protestantism, all the anathema of Catholicism or even the senate and courts of the United States cannot destroy it. They were first to drive out the myth of the American desert, and make it a mirage on the map of the West. They were the first to plant alfalfa and apples and peaches in arid America, and today our minds turn to these irrigation pioneers when we consider the Gunnison tunnel and the other government projects that are transforming the West. In days to come the arid mountain regions will prove to be the lands God loved, the best instead of the land He forgot. Colorado is spiritually free, and has no special religion to offer save that of fellowship and brotherhood to those who come to help us build and ideal commonwealth.

The prototype of the clover fields that wintered the flocks and herds of Abraham are seen in the alfalfa fields of Colorado and other arid states. They are not alone material assets, but upon the landscape they are spots of beauty, their vivid color when viewed from our hills seem like brilliant emeralds upon the breast of the desert. These crops are permanent in the ledger of man's resources. Commerce may fade and fleets may sink, empires and cities may become one with Ninevah and Tyre, but the apple and the alfalfa of an irrigated field will bear its fruit and fodder as long as the sun shines, water runs and man works. Around the broken graven granite gods of forgotten religions the Egyptian peasant of the twentieth century guides his wooden plow and gathers harvests from the fields the Pharaoh tilled. Religions may disappear, learning may be forgotten, the palaces that Caesar builds will crumble, anarchy may upset courts, laws, institutions, but the irrigated land, it abideth forever.

Alfalfa is not a transient grass, its roots may not take hold on the center of specific gravity, but they do have a keener sense for hidden water than the magic water finding hazel rod of my boyhood.

Recently, when telling of an old Colorado pioneer, who had followed an alfalfa tap root 90 feet, Judge Bell remarked that he knew it to be true, and that in his section the alfalfa grew so high that it blossomed above the clouds, and the bees that gathered honey from their flowers, swarmed in heaven. While alfalfa roots may not go down to the hot belt, or its bloom to the skies, its tenacity of life, its wealth of use, its ability to thrive in dry countries, makes it God's best gift to the semi-arid lands. It is among grasses what the camel is among animals. It survives and blesses where the other varieties perish. As bluegrass has made Kentucky famous, so will alfalfa become the pride and glory, as it will be the profit and redemption of our western arid empire. Every year the possibilities of alfalfa are being widened, American scientists are studying the plant, varieties are being brought from every arid land by selection and mixing, new qualities are being developed, new varieties grown. In connection the soil and condition of every section are being studied. The day will come when there will be no grassless land in our country, any more than there is a great American desert between the Rocky mountains and the Missouri river. Alfalfa is to make conquest of the desert, nor is it alone a plant of the desert; it will flourish everywhere.

The best investment made by the United States since the Louisiana purchase, has been the \$42,000,000 spent in conserving water. For the part Roosevelt took in starting these enterprises, he will be remembered long after his other virtues and peculiarities are forgotten. By conservatism, dead land equal in productive area to a great state has been reclaimed. In other sections floods and marshes hold fallow and useless other vast regions that should produce. To make the wet the dry lands and make dry the wet lands are problems for our engineers and economists.

Nations that suffer from low water and from floods in alternate seasons will by future scientists be classed with the stupid nations. Nature supplies us with ample water, if we have not the sense to apportion it properly, we have no call to curse the gods. Those who will not dam the waters have no right to damn the Creator. In effecting

the happiness of our people, the water reclamation and conservation policy will prove as beneficial as Lincoln's proclamation of emancipation.

No administration will ever need to apologize for money spent to reclaim waste lands to make them fit for homes. There is no policy of national defense as certain as that which encourages ownership in our soil. Every American citizen that is planted upon a productive acre of land becomes an additional rivet in the armor of national security. It would be a reckless power that would assail a nation of home owners. In Colorado, the government has just completed the Gunnison tunnel, making as fertile as the Nile valley a domain of arid land for 4,000 modest farms. The cost has been \$3,500,000. One battleship costs as much as three Gunnison tunnels without considering that the one is a constant and tremendous liability, while the other is a growing and perpetual asset and dividend payer. Which is the best investment? Apple orchards and alfalfa fields are better nurseries for citizenship than

The home owner becomes a soldier of defense, enlisted for life.

Forty-two million of our people do not own their homes. The destiny of our republic will be shaped and determined as we increase or decrease this percentage of tenant Americans. To illustrate the closeness of happiness, security and prosperity to the soil, no crop will illustrate better than alfalfa and apples. These are but two out of a hundred golden products of rural life, but they represent small farms, intense cultivation and certain success. They stand for well cultivated lands, for close settled communities, for convenient schools, churches and markets, for telephones, free delivery and for homes blessed with all the conveniences. The 20 or 40-acre apple or alfalfa farm may not admit of a Newport summer home or a yacht upon the sea, but it will be free from the temptation, dangers and heart and soul wrecks that so often invade the perfumed white way of luxury. Bonanza mines, commerce and speculation sometimes wins larger prizes



In 1909 the Dempster Mill Mfg. Co., Beatrice, Nebr., sold one of their 8 H. P. Horz. Four-cycle Gasoline Engines and a No. 4 Centrifugal Pump to a Mr. Phillips about three miles southeast of Longmont, Colo. The plant is shown in the illustration, and demonstrates the efficiency of both engine and pump for irrigation.

decks of ships or military camps. Free government has no ally as strong, as sure as the home owner. Land and liberty are close allied. A title deed to an acre of land is a guarantee of patriotism. Property owners always desire better government. Anarchy makes no recruits among taxpayers. Insurrection never received shelter, sympathy or contribution from the owner of an apple orchard or an alfalfa field. Even socialism stands abashed and impotent in the presence of a self-reliant, independent owner of a debt free piece of productive land.

The armies and fleets of Japan are not half the menace to our republic as are the unemployed and propertyless of the country. Idleness and poverty are the breeding ground of riot and revolt. Turmoil and lawlessness brings no harm to those who have nothing. Those who have to pay the cost of disturbance and upheaval, the land and home owner, are the bulwark of stability and safety. Stockholders make the best guardians of property and institutions. Self interest is the most reliable thing in the world.

but the risk and hazard are greater. Ninety-five per cent of those in the marts of trade fail, of the sons of industry who follow the plow 95 per cent succeed. Their earnings may not be large, but every dollar is bright with the smile of honest toil, and upon them rests the benediction of Almighty God.

Apples and alfalfa are permanent and abiding, Gold exhausts, it has but one crop, it plants no seed. Civilization depends upon reproduction, therefore, gold cannot be its prophet and savior. The gold that Solomon mined litters the bottom of the seas, the very mines from which it came are lost but the seed from the apple that played its part in the drama of Eden finds its progeny in the bud and blossom and fruit that glorify the orchards of the twentieth century. For 200 generations the apple has blessed the race, almost making amends for being the cause of man's expulsion from Eden. Alfalfa goes back to the infancy of the world. God made it on the third day of Creation. It has ever been good for man and beast.

It was alfalfa salad, upon which Nebuchadnezzar fed, its foraging in the fields with the brutes was physical and moral tonic, for the Bible says that after seven years of browsing in the alfalfa pastures, he became a greater king with the glory of his kingdom, his honor and brightness restored.

The benefits that will come to the American farmer from studies of alfalfa, only are worth more than the cost of all the agricultural colleges in the land. It is a delusion to think that science is not practical, that it will not pay. Those who experiment the most, reap the most dollars. A good agricultural paper pays the largest dividends of any investment a farmer can make. The bulletins issued by the agricultural department at Washington and by the various agricultural colleges of the states, are often veritable prescriptions of gold to the farmer, who studies and follows them. Knowledge is power everywhere.

The farmer who does not take advantage of the investigations and experiments of state and nation, is stupid. He is throwing away diamonds and gold; he is not a farmer, he is a fool. It is the Burbanks and not the kings of Wall street who are the benefactors. Those who develop a new or improve an old variety of fruit, food or fodder, are greater than those who rule in the capitol, or who by manipulation and combination, gather billions of tainted dollars. From the Missouri to the Pacific is the true land of alfalfa. Its promotion is a matter of national concern. It spreads the domain of possible homes. It builds houses of comfort and great barns. It raises the grade of the cow, sheep and the pig. It is the crop that never fails; it never wants for a market. The home stock pens make an ever pressing and profitable demand upon the supply. The farmer that consumes the product of his meadow, has found the sure road to prosperity. Alfalfa lends itself to this home use. It is the "Fortuna's purse" of modern agriculture. It pays debts, lifts mortgages; it sends Sam to college and Mary to the normal school. It helps mother in a hundred ways and puts a flush of independence, if not impudence, in dad's eyes. It relieves the tension of unending toil, improves the place and the stock, adding to the returns from creamery and stock yard, makes the farmer a depositor, and not a debtor at the bank. It buys pianos, carriages and books for the family, it widens their outlook and links the farm with neighbors and the world. What the Bessemer patent was to the iron industry a generation ago, alfalfa promises to be to the western farmer, as an investment it is better and safer than Wall street water or brewery stock. Alfalfa is the best rotation crop; it restores the nitrogen of which grain and beets rob the soil, and make it as rich as before the plow turned the virgin soil.

The alfalfa field has its asthetic virtues, the emerald green of its fields rests the eye and feeds the nerves as we travel through a thirsty land. It has a charm for man and all living things. In its verdant aisles the dove and the meadow lark build their nests. To the burrowing mole and the field mice and insects of the earth its waving mass is a mighty forest, bees prefer its blossoms to roses, birds sing sweeter as they wing over the fragrant field. An alfalfa fed Colorado lamb brings the highest price and gives the sweetest meat that has touched the palate of man since he ceased to be a vegetarian. Had Moses eaten Colorado alfalfa and pea fed pork, he would, like Lamb's Chinaman, become a convert to roast pig and the Bible would have carried a commendation and not a prohibition of swine. We are with Pinchot when he says, "Save the tree," but we want the settler to have the treeless area; we would have him reforest it with apple trees and conserve the moisture with alfalfa fields and enrich it with hogs, sheep and cattle. Where a home can be planted, a mine opened, or an acre cultivated, the government should make the use easy. The farmer and the miner were the founders of our western states, and their encouragement is the first duty of the republic. The destiny of this country and free government depends upon those who till the soil. Land ownership and the public school are the antidotes for the poison that floods our country through the gates of Castle garden. Every man who owns an acre of alfalfa or sits beneath his own vine and fig tree, is a pillar in the temple of national safety. Their possession can make even the new emigrant a patriot. Congested centers of homeless, propertyless people are the menace. No demagogue, no

nihilistic propaganda can sweep a community of home owners or soil cultivators from their anchorage of patriotism; no political convulsion can shake our institutions or lead astray those who own the land they plow and reap. To discourage large holdings of public domain, to encourage ownership of 10, 20 or 40-acre farms, is becoming an economic policy of profound wisdom. The nation would be stronger, the average of the people more prosperous if there was no farm over 160 acres in extent. Small farms would mean diversified crops, intense and careful cultivation. It would double the production upon the same number of acres. It would raise the average acreage yield of wheat in the United States from 13 to 30 bushels and other crops in proportion. The rapid absorption of all desirable land, the resistless pressure of an increasing population makes this a problem of immediate moment.

The present adjustment of production and distribution does not seem to meet the requirements of a free people. Something is wrong, when in a land of plenty and opportunity bread lines form and thousands surge from city to city seeking employment. It is not an ideal condition where honest men seek work in vain; not an ideal state where labor and capital both think it necessary to keep pickets out; not a credit to democracy when in our cities the brewery is the advisor and contributor to both political parties and the saloon a potent factor in politics.

These with the official grafter and corporation briber are the Hun, the Vandal and the Goth of the republic and civilization. These evils are city bred. They can only flourish where man is homeless and landless. The man who plows a field and plants a tree can be trusted; he will defend the flag and never pollute it. Hay fields and orchards, a pasture and a garden land may not develop millionaires, but they will raise men and diffuse prosperity and independence. The prayer of the patriarch was that he be given neither poverty nor riches. In an irrigated region of small farms, this ideal can be realized. There will be no rich, no poor; all free, equal and independent. The test of civilization is the average welfare of all, not the opulence of a few. England loans \$15,000,000,000 to other nations; yet has more paupers than the nations that borrow her gold. Eight thousand people own all her land and a million mendicants walk her streets and highways. Iowa, Dakota, Kansas and other agricultural states loan no money abroad, but they have no paupers, no one hungry, no professional servants in all their millions. Those who raise alfalfa and apples, who own and work their limited acres, will not be interested in the price of private cars, but they will never know the road that leads to insolvency. The bankrupt court is an unknown continent to them, but their days will be filled with healthful, useful toil and their nights with untroubled dreams. The tilling of the soil is the first of professions, the king of trades. There is no danger line in land culture, no shipwrecks, no collisions or derailments, no explosions, no risks or hazards to insure against. With industry, common sense and water, the harvests are sure. Now and then a gold brick, a bogus tree man or a bunco machine or book agent extracts tributes, but these are minor annoyances, but mosquitos of life. Altogether it is not only the oldest but the safest business. It is a self-reliant pursuit, a respectable vocation. No man ever attained such eminence in our country that he was not proud to claim the farm as his origin. Fourteen of our presidents have been tillers of the soil. More greatness has come from the cradle of the rural cottages than from city palaces. It gives to the diligent and sensible a certain livelihood and independence and these are of more worth than the glittering promises and phantom gold of speculation. Of course, all conclusions assume good sense and industry. You cannot be a successful farmer and be a loafer any more than you can be a horticulturist and not know the difference between a Ben Davis and a Jonathan apple or be a zoologist and not know the difference between a lizard and a wizard. Knowledge and work are fundamental. Adam and Eve were the first horticulturists, the apple was the first fruit named; it is so fine of look, so rich in fragrance that to test its flavor they risked their fresh and unseared souls. The apple started with man in Eden and it will be with him in Paradise. That fruit was made before meat may have been the Creator's hint that in human

(Continued on page 612.)

Cotton Growing by Irrigation

By W. D. HORNADAY.

Cotton growers throughout the South have had their interest aroused by the reports that have come from the lower valley of the Rio Grande in Texas of wonderful results accomplished there by growing cotton by means of irrigation. It is claimed that what is being done in that region in growing cotton can be practiced successfully in other parts of Texas, and probably other southern states. The average yield of cotton per acre under ordinary methods of farming, when the rainfall is depended upon to supply the moisture for the growing plants, is less than one-half bale.

In the lower valley of the Rio Grande this season, where irrigation was practiced in growing the crop, as high as two bales per acre is being obtained by farmers. T. P. Cheney, who has a farm 2½ miles south of the town of Donna, has picked eighty bales off of sixty acres up to September 10, and it is conservatively estimated that before the crop season closed he will have gathered sixty more bales from the same ground, making an even two bales per acre. The revenue

its appearance to solve the problem of its eradication, or, at least, to so minimize its destructiveness as to make it no longer a hindrance to the production of a bountiful crop each season.

Owing to the fear of the weevil pest and the lack of knowledge on the part of the planters of that region of how to cope with it by cultural methods in growing cotton, but little attention was paid to growing that staple upon these rich lands until about three years ago when about twelve hundred acres were planted in cotton in the valley. The yield proved so much greater than was expected that other planters entered the industry and there was grown this season about twelve thousand acres of cotton in the territory around Mercedes, Harlington, San Benito, Donna, McAllen, Mission and other towns situated in the lower valley of the international boundary stream.

It was upon a farm near Mercedes that the first bale of this year's cotton crop in the United States was raised. This fact served to attract the attention of many planters in other parts of Texas and the South. It led to an investigation on the part of many of these men with the result that the cotton acreage in the valley will be increased many thousands of acres next season. One community of cotton planters in Alabama sent a representative to the Rio Grande valley section recently to investigate the reports that had reached them of enormous yields of cotton. This man verified the reports and expressed himself as astonished at the won-



Delegates to the Eighteenth National Irrigation Congress

from the 120 bales will be approximately \$9,000, not counting the seed which will sell for enough money to pay all the expenses of the crop, including its planting, cultivation, picking and marketing, according to Mr. Cheney's estimate.

This is only one illustration of what is being done in that region in growing cotton. It is not unusual for one bale of the staple to be grown per acre by the valley farmers. When the harvest of cotton is over the same land is planted in winter vegetables or other kind of crops, and they are gathered and out of the way before the next cotton planting season arrives.

One of the most important features of this new era of cotton production that has been inaugurated in the Rio Grande valley during the last three years is that it has resulted in such a reduction of the boll weevil pest that those insects are no longer considered a serious menace to the crop. It was in the lower Rio Grande valley that the weevils first made their appearance in the United States. They crossed over from Mexico about ten years ago and rapidly spread northward and eastward until they covered practically all of the cotton growing area of Texas and the South. The pest has caused many millions of dollars of losses to cotton planters since it began its invasion of this country. It has been left to the cotton growers of the region where it first made

derful results that are being accomplished in the industry there. He said that his favorable report would cause many planters of Alabama to move to that section.

A number of new settlers from Northern states who have never had any previous experience in growing cotton have met with remarkable success this year. Roy Randolph, a young college graduate, located near Harlington several months ago, planted seventy-five acres in cotton. Despite his lack of experience in that kind of farming he made his land yield him an average of one bale per acre. He has sold sixty-eight bales for \$5,143, exclusive of the seed which is valued at \$10 to \$12 per bale. His revenue from the whole crop of the seventy-five acres, including seed, will be about \$6,400. His expenses of growing and marketing the crop are estimated at about \$25 per bale, leaving him a net profit of approximately \$4,525. This handsome sum was made in seven months and he still has five months out of the twelve in which to grow a second crop of some other kind upon the same land.

It is claimed by cotton growers that labor is more abundant and cheaper in the lower Rio Grande valley than in any other section of the country. Mexico supplies an inexhaustible available supply of men, women and children during the picking season.

(Continued on page 630.)

Eucalyptus Timber

California's Greatest Industry

BY JOHN W. WARD,
President, International Eucalyptus Associations

One of the greatest problems before the industrial world today is that of adequate timber supply. A supply of timber, of wood, is vital to human life, and absolutely indispensable to progress and prosperity. The American people did not earn, nor do they appreciate the magnificent endowment of native timber with which they are blessed; they did not acquire it by the sweat of the brow, did not laboriously propagate the millions and billions of forest trees, did not plant them and foster their growth. The timber was here, it was easily taken, and, like many another thing, easily acquired, is as easily dissipated.

It is time to stop and think. The heritage is fast disappearing, and the time is fast approaching when a vast

while exact data is not available to prove the assertion, it is believed that as much timber is consumed and destroyed by forest fires and wasted through inexcusable logging methods, as all the timber utilized by men. Allowing for these causes to greatly increase the destruction and consumption of the remaining timber, the twenty-three and one-third years seem alarmingly reasonable.

And the situation with reference to the hardwoods alone is much more menacing. The Forestry Bureau, adopting the largest estimate ever made on remaining hardwood timber, states the United States has standing an available supply of four hundred billion feet. Seemingly an inexhaustible supply until the same bureau estimates the annual consumption at twenty-five billion feet. A sixteen years' supply of hardwoods and the last tree is gone.

The price of hardwood timber has not kept pace with the advance of the soft woods, and yet the advance is almost 100% in the last twelve years. As the supply approaches an end, as the proportion of reserve to increasing demand grows more acute, the price will become prohibitive for a multitude of purposes for which hardwood is now deemed indispensable. The result can be imagined: Commercial depression in its broadest sense, compared to which in its far-reaching effects, a full-fledged panic is but a summer's breeze.



Pueblo, Colo. Mineral Palace in the Background.

work must be done to maintain a supply of timber—thoughtlessly deemed inexhaustible by a great majority of America's citizens even to this day. But stop. Think. Figure. Be serious for a time and consider the facts as presented by the Forestry Bureau of the United States Government. A few simple calculations will serve to convince every reader that he who plants a tree is doubly blessed.

Considering every wooded acre in the United States, in private and public ownership, the nation holds a scant 700,000,000 acres of wooded area. A tremendous amount of timber. But, every working day about 100,000 acres are cut over, partly utilized, largely wasted, and reproductively wholly destroyed. One hundred thousand acres each day means 30,000,000 acres per year. Cut out the bewildering ciphers and you will be startled to see that twenty-three and one-third years will see the last tree cut. The figures are big, they are comprehensive, covering the whole great nation. Some sections will be stripped in a few years, while other sections will hold to the last. And just one more strong statement so that the reader may no think the figures unfair: The figures are based on present rate of consumption, whereas per capita consumption is increasing and population is rapidly piling up. And

The pessimist will mourn over the figures and deplore the waste; the optimist will feel that something will surely solve the problem and will seek for a remedy to the situation. Whenever the world in its onward march has struck a stone wall in the path of progress, something has always "turned up" to clear the way for industrial and economic advancement. A nation was isolated, its commerce limited to narrowest scope, and we find the sailing vessels. Another era and something had to move the stone wall from the path—and steam transportation by water and rail opened up a broader horizon. Again physical limitation handicapped commerce and industry—the telegraph and telephone cleared the way. Coincident with these steps in commercial advancement, science developed the steel industries, opened up the natural resources of forest and field and mine, until today the United States is the most highly commercialized, systematized, specialized, and I might say, idolized, nation of the world.

The Pacific Coast will be the salvation of the timber industries—soft woods and hard woods, because they are already here, and before it is too late there will be established a system of conservation, regulation and afforestation which will get the utmost from the timber re-

serves without depleting timber capital. Hardwoods, because the State of California can grow them. The eucalyptus will solve that one problem if California will get back of the timber planting enterprises with sufficient strength. What greater claim for immortality can California hope for than to save the nation from a hardwood famine?

To say that California will one day be the hardwood center of the North American continent may seem a wildly extravagant statement, yet I do believe it most thoroughly, and that belief is based on a very close study of supply and demand in the hardwood industry, on the commercial species of the Eucalypti, on their rate of growth when planted commercially in forests, properly cared for, and on the suitability of the timber produced, to take the place of all other hardwoods for all purposes in construction, manufacturing, and the arts; and, lastly on a close study of the really enormous profit that must accrue to the farsighted men and women who will make the same study and invest their savings and earnings in an industry which has for its backing, one of the most solid, most conservative and most important industries of the world—commercial hardwood timber.

Overdo the industry? Not in your time, nor in mine. Millions of acres of Eucalypti must be planted before the production can equal consumption. We can speak of 700,000,000 acres of native timber lightly and easily, but think of the time consumed, the investment required, and the labor necessitated in the planting and cultivation of even 1,000,000 acres. California can plant 100,000 acres each year for ten years before the first million mark is reached, and, before that time will have passed the consumption will have doubled, and the value more than doubled, and the State will be further from a supply than in the very beginning. One hundred thousand acres each year is doing well, but it is only a pitiful beginning of what should be done.

If the plea was for the sake of future generations, there would be but slight response—such is human nature. But the commercial Eucalypti will produce a quick return, will show a profit to excite the avarice of the most grasping, and they promise that profit in so short a span that even the aged are made enthusiastic.

What is the timber of the commercial species of the Eucalyptus tree good for? Let us begin with the commonest and meanest uses: It is good for fuel, for poles, posts, piling, mine timbers, and all underground and marine architecture; for railroad ties, pillars, bridge timbers, car construction and scores of railroad uses; for ship-building, decking, sheathing and spars; for furniture, fixtures and fine interior finish; for cooperage, slack and tight, for oil, whisky and vinegar barrels and kegs; for tool handles, spokes, felloes, hubs, neckyokes, double trees, whiffle-trees, plow-beams, and for all implement and vehicle work; for bowling alleys, finest flooring; for cross trees, insulator pins, pulleys and block; for finest uses in musical instrument making, such as pianos, organs, violins; in short, for all uses for which hardwood is ever used. Be it most particular and technical, some species of the Eucalypti will provide a suitable wood.

Let us see upon what the secret of greatest profit from Eucalyptus growing is dependent. First and foremost, an unquestioned necessity, is quantity. There must be enough timber available in one body to warrant and demand the finest sawmill and adequate manufacturing facilities. To be sure, Eucalyptus will make a handsome profit for firewood only, but we are speaking of the greatest profits, profits from timber, from lumber, and not from fuel. A few acres would not have half the value per tree compared to the same quality of timber in a large acreage, as amply witnessed in the history of lumbering. A large acreage of uniform and maximum yielding timber commands an enormous premium over the small tract.

State and Government reports indicate an average ten-year-old Eucalyptus tree, properly planted and cared for, to contain 200 board feet of clear lumber. Using this estimate as a basis for calculation, let us arrive at a conservative valuation of an acre of Eucalyptus timber in ten years. Out of 680 trees planted, the large com-

mmercial planting companies producing plantations of thousands of acres, guarantee at least 500 healthy, growing trees, which, upon the estimate above referred to, will yield 100,000 board feet of lumber per acre. Present stumpage prices for hardwood would command a price of \$25.00 per thousand feet, and by "stumpage" price is meant the selling price as it stands without the necessity of cutting or marketing the same. Use your pencil now: 100,000 board feet at \$25.00 per thousand—**Result, \$2,500.00 per acre.**

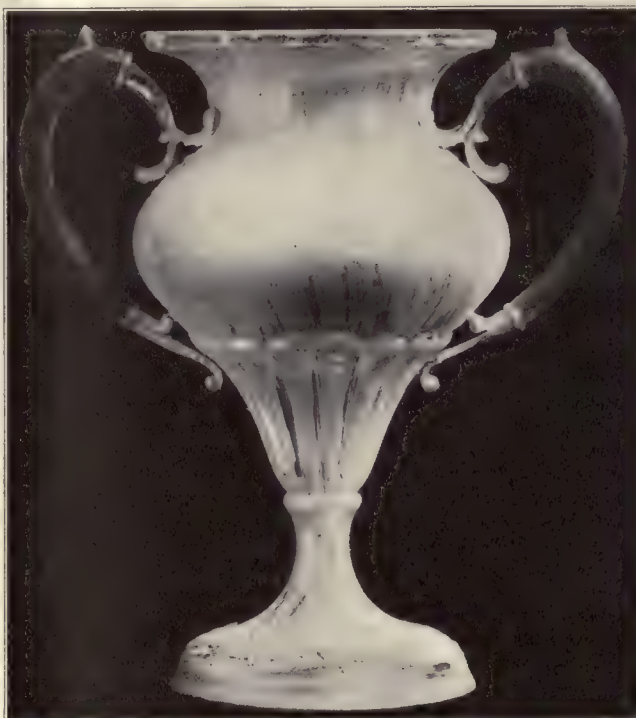
Can you question such authorities as the United States Agricultural Department and California State Board of Forestry as to the growth of the timber? Can you question the present market price of hardwood stumpage and lumber? If you do, we have no other authorities to offer and you would not become convinced of the wonderful possibilities of this industry even though you investigated for yourself by going to California, there to see the timber growing in all its splendor.

A ten acre tract of Eucalyptus timber in a great plantation of thousands of acres, will, according to the highest authority obtainable, produce the neat little fortune of \$25,000,000 within a period of ten years. Time has never determined the number of cuttings possible, and here would be created an estate perpetual in its earning power.

It is the opportunity of a life time for those of limited means, who, now toiling, are looking forward to a day not far distant when ease and comfort may be their lot. California welcomes you.

WINNER OF IRRIGATION AGE TROPHY.

We are showing herewith a loving cup which was offered by the IRRIGATION AGE as a trophy at the National Irrigation Exposition, which was conducted in connection with the National Irrigation Congress at Pueblo.



This trophy was awarded to I. B. Humphreys & Co. of Denver, Colorado, for the best device for raising water from the underflow for irrigation purposes.

We congratulate the Humphreys Company on their success in making so attractive and practical an exhibit.

A THOUSAND PUMPS A DAY.

A NEW pump every minute is a record of which any manufacturing plant might be proud, but when it comes to making a thousand pumps every day of every week of every month of the year, it is a showing which few manufacturing plants in the world are capable of making.

A few years ago F. E. Myers & Bros., manufacturers of Ashland, Ohio, had dreams of being able to turn out from their factory one new pump every minute during the nine hours of every working day in the month. They hoped to reach that mark somewhere around 1912, but their business grew so rapidly that it was passed long ago and the race is now to reach the goal of a thousand pumps a day to keep up with orders.

The Myers Brothers found that a pump every minute would not begin to supply the demand and their plant

The rapid development of business requires, not only a larger number of pumps, but much larger sizes which call for additional floor space, the latest and best machinery and every modern appliance that can be provided for rapid and safe construction.

Some idea of the extent of the manufacturing business of this firm can be gathered when it is known that a single order for \$8,000 worth of goods was recently received, to be delivered by the first of October. Large orders are also coming from South America, Australia and every part of the world where irrigation is known, and in everyone of these far away countries the name of Ashland and the Myers Brothers is now well and favorably known.

National Land and Irrigation Exposition.

The National Land and Irrigation Exposition, Pittsburgh's big Land Show, which is to be held at Duquesne



Exhibit of New and Improved Goods of F. E. Myers & Bro., Ashland, Ohio.

has been increased by large additions to their foundries, new buildings have been added and still the cry for more pumps is constantly pushing the capacity to the limit. In order to take proper care of the business a new and large foundry has become imperative, and new buildings must be erected to house it. These will occupy an entire square between Church and Orange street, Ashland, and a large portion of the square bounded by Orange, Fourth and Union streets, to which is added some additional property, giving them an L-shaped foundry, 140x240 feet. The new foundry will be located so that it will be surrounded on all sides by the property of the Myers brothers.

Gardens in that city, promises to be a very live affair.

Mr. Francis C. McCarty, director of administration, has the matter well in hand, and we believe that all of the details will have been fully worked out so as to present a well dressed show on the date of opening, October 17th.

Western people who are interested in this subject, particularly those who are attempting to sell lands or bonds to eastern people, would do well to study this show, and if possible have some sort of representation there.

THE IRRIGATION AGE has secured good space from which thousands of copies of this publication, as well as copies of the Primer of Irrigation will be distributed, and the publisher hopes thereby to add largely to its circulation.

(Continued from page 607.)

diet, it should be first. More fruit and less meat will tend to make man better and healthier. Diet influences man and shapes his destiny; meat eaters are not good subjects for revivals. Others besides the Almighty regard fruit as the choice food. Lamb said that "a man cannot have a pure mind who refuses apple dumping." I would not care to endorse so wide a statement, as it would involve a blanket commendation of cooks. If all cooks were the kind that mother used to be that would be easy, but some cooks are responsible for many crimes. To bad cooking may be chargeable the drab and sombre hue the world takes on for the pessimist and the Calvinist. But there is something twisted in the man who does not like a good apple, especially the Colorado variety. The apple that tempted Adam was a Colorado Jonathan and I cannot blame him that he did eat it. Dr. Hewitt, the distinguished archaeologist, insists that Colorado was the seat of original Eden, which confirms the identity of the apple that figured in the garden where the race was born. The apple still holds the glories that tempted the first three actors in the fall of man. Is there anything finer than the apple blossom, or the odor of the stored fruit, the fragrance of the tree in flower? Earth has no sweeter appeal to eye and smell than the pink and red and white in their setting of fresh, soft green leaves. No artist mingled colors in such perfect harmony. Man is a bungler compared to nature in placing tree and flower and plant. I have seen peach blossoms in the South, the cherry blossoms of Japan, and the flowering almond in many lands, but none were as beautiful as an apple orchard in May. If the apple tree bore no fruit, it is worth its keep for its fragrance and beauty. Ruskin says that "a blossoming apple tree is the loveliest thing which graces the world today." The senses need feeding as well as the profit account. Apples satisfy four senses, while the birds in their branches give their songs of gladness to the fifth sense. Apple culture is not all beauty and sentiment. The \$2 a box they command in the market give a practical sensation that does not detract from the romantic side. The apple may have made trouble for Adam, but it has been the friend and banker for his Colorado descendants. The market returns meet the cold blooded demand for sordid dividends, yielding in gold coin a certain per cent that makes Colorado orchards desired investments at \$400 to \$4,000 per acre. Single apple trees produce more value than an acre of wheat in Dakota or an acre of corn in Iowa, and the product of an acre enough to pay a large part toward an eastern farm. Five thousand carloads is the Colorado apple crop for 1909—and buyers crying for more. Science has decided that apples are the best brain food, that no other fruit contains so much phosphoric acid in digestible shape. These facts should induce any man who considers his own or his country's welfare to join in the apple-a-day club; their motto is "an apple a day, keeps the doctors away."

Reformers are suggesting apples as a cure for the drink habit; this should start an apple boom over the country, where the crusader is making the map white with dryness. To every mortal, fruit and flowers carry a message of delight. They are nature's universal poetry, and awaken the memory of an Eden that is gone and throw across her horizon the hope of the Paradise to come. To own a piece of ground is the hope of every normal man. He dreams of a time when he can hold a title deed to an acre of land and upon that acre plant a tree from whose fruit he may pluck and eat. This love of orchard and garden is the home instinct that flames in every heart, and is the lingering hint of man's origin in God's first garden. It is the wisdom to obey this natural impulse to possess the soil. Most men waste enough each year to start them on the road to ownership of a lot, a home, a piece of land. A little sacrifice, a little self-restraint, even the giving up of a bad habit, the omission of the weekly poker game, the daily drink; a little less tobacco will secure a piece of Colorado orchard land, raising the buyer into the ranks of the taxpayer, the home owner, the citizen that has a reserve and is not perpetually haunted by the fear of accident and the coming of the "rainy day" for which no provision is made. Get your acre of Colorado land, and if you want pleasure, plant apples and know the joy which nature ever confers upon her votaries. If you want health,

plant apples; the work, the air, the sunshine will drive away disease, and keep doctors' fees at a minimum. If you want food, plant apples. There is no diet more perfect, pleasant or digestible. If you want profit, plant apples. The acre returns in Colorado and the arid mountain states is greater than the dollar yield of the golden oranges of California, or the acre crops of any annual product of the soil, the world around. The returns from some of the orchards of the West are like the dream-laden argosies from Golconda. Is there any other crop which so perfectly satisfies the eye of the artist, the pleasures of production and the grasp of avarice? The apple is a good tree to plant in waste places, along roads and streets. Every farm should have its orchard, every lot its apple tree. It would be easy to prove also that we owe the planting of apple trees as a memorial of gratitude to Mother Eve. She it was who had the courage to dare the responsibility of good and evil; it was her nerve that made man a free, moral agent. God loved her for her disobedience. As I read the story, it was Adam, not Eve, that was driven out of Eden. Eve voluntarily followed Adam, knowing that he needed her wit and love. The poets have found the flowers well loved subjects for their poetry. Scott saw the beauty in the thistle of Scotland, Byron glorified the rose, and Burns the daisy. Wadsworth wrote, "My heart with pleasure fills, and dances with the daffodils." All praise the primrose and the modest violet; many rhapsodies over the clover's summer sweetness, but its sister, the alfalfa, is a name unknown in the vocabulary of poetry. The apple blossom, too, is forgotten. If my pen was poetic, it would be these two neglected favorites of the humming bird and bee, whose glory I would sing.

If I am called in spring time, no flower will be more welcome to my fleeting spirit than apple blossoms; no monument would be finer to mark my place of rest than an apple tree, and when I enter that realm where every month has its fruit, where flowers ever bloom, and woman is always young and fair, I can ask no Heaven more perfect than where the fields are perennial with the purple and green of alfalfa, and the paths are embroidered with apple trees in blossom and the air fragrant with their perfume.

FOUNTAIN VALLEY PRODUCTS.

The exhibit of products from the Fountain Valley shown at the National Irrigation Exposition in connection with the Eighteenth National Irrigation Congress at Pueblo, Colorado, attracted wide attention.

Messrs. Riddoch and Pyles, of the town of Fountain, collected a fine variety of vegetables and general farm products and delivered them in good condition at the show grounds, near the Mineral Palace.

A practical demonstration of this character will do much to advertise Fountain Valley and the lands under the Fountain Valley Land and Irrigation Company's tract.

Elsewhere in this issue will be found an advertisement of the Fountain Valley Land and Irrigation Company.

DEBTS ARE DEBTS.

And They Must Be Paid, So Decides the Supreme Court of Michigan.

The Supreme Court of Michigan, in an opinion delivered September 28th, held that International Harvester Company of America is not debarred from collecting its outstanding debts by any plea that it is a "trust". The circuit judge decided the other way, but his decision was reversed; and the defendants will be compelled to settle their accounts with the company.

This decision is not only of the utmost importance to all large trading companies, but to the general public. Incidentally, it once more brings to view the streak in human nature which deems it defensible to steal rides on railway trains, to smuggle personal purchases through the custom house, and to break contracts with large corporations.

The facts in the case are that the International Harvester Company of America, several months ago, began action against some dealers to collect a balance long overdue. There was no equitable defense against the debt, but the defendants hit upon the novel plan of setting up the claim that the company was a "trust", and that this was a bar to the collection of the amount due. Strange to say—a lower court sustained this claim, but on appeal the Supreme Court reversed the decision and ruled that the plea that a plaintiff is a "trust" is not a good defense.

A company selling an article or commodity bears precisely the same relation to the purchaser at the time the obligation falls due that it did at the time the purchase was made. If the decision of the lower court had been sustained it would be impossible for any large company to continue in business except upon a strictly cash-in-advance basis.

Supreme Court Decisions

Irrigation Cases

RELATION BACK.—

Where the construction of irrigation ditches was prosecuted with proper diligence, the rights acquired related back to the commencement of the work.—*Whited v. Cavin*. Supreme Court of Oregon. 105 Pacific 396.

PERCOLATING WATER.—

It is unlawful for one owning land bordering on a stream to intercept percolating waters therein and apply it to any use other than its reasonable use on the land from which it is taken, if he thereby diminishes the stream to the damage of those having rights therein. *City of Los Angeles v. Hunter*. Supreme Court of California. 105 Pacific 755.

RESERVATION OF WATER.—

One appropriating water under Const. 1879, for sale, rental, or distribution, is but an agent of the public for the distribution of such water to such members of the public as may apply for them and pay him the legal charge for the service rendered by him. *Leavitt v. Lassen Irrigation Co.* Supreme Court of California. 106 Pacific 404.

BREACH OF CONTRACT.—

Continued refusal of one, to whom an irrigation company furnished water under a contract, to pay therefor, is a breach of the contract, justifying the company in treating it at an end, and suing in the absence of a legally established rate, for the reasonable value of the services rendered. *Lassen Irrigation Co. v. Lang*. Supreme Court of California. 106 Pacific 409.

PRIORITIES.—

Any person or number of persons may have an interest in or become the exclusive owner or owners of different water rights, each of which rights may have had their inception at different times, and in such cases the order of their respective priorities must necessarily depend on the dates of the initiation of each particular right. *Whited v. Calvin*. Supreme Court of Oregon. 105 Pacific 396.

POSTING NOTICES.—

Where defendants did all acts required for the valid location of a mining claim by recording notice of location in the county recorder's office, staking and developing the claim and posting notice of location on the claim, it was immaterial as against subsequent locators that the only valid notice of location was posted after the notice was recorded. *Green v. Gavin*. Court of Appeal, Third District, California. 105 Pacific 761.

SALE OF WATER—DAMAGES.—

In a suit involving damages for failure of a vendor to furnish a certain number of inches of "bought water" to be furnished by a ditch company, no other measure of damages was competent than the value of the water, in the absence of evidence that no such water was obtainable, and a decree for the supposed diminution in value of the land, on the basis of the price paid per acre, was erroneous. *Starbird v. Jacobs*. Supreme Court of Colorado. 105 Pacific 872.

PRIOR RIPARIAN OWNERSHIP.—

The owner of 7½ acres of land upon which springs arose forming a pond, the waters of which flowed across the property of another, had a right to permit his stock, consisting of as many as 6 cows and 6 or 7 horses, and his geese, to the number of about 20, to drink from the pond and to go into it, though a pollution of the water resulted; such use not being unreasonable. *McEvoy v. Taylor*. Supreme Court of Washington. 105 Pacific 851.

RECORDING NOTICE.—

The recorded notice of a mining claim need only be similar to that posted upon the ground and show that claimant claims that the land described and identified therein, so that, where the notice recorded was a copy of a posted notice which was insufficient because not posted within the claim, that the valid notice subsequently posted, which differed from the first notice only in omitting the name of a witness, was not again recorded, was immaterial as against subsequent claimants.—*Green v. Gavin*. Court of Appeal, Third District, California. 105 Pacific 761.

DETACHING LAND.—

Where the owner of land proceeds in equity to have the same detached from an irrigation district, in order to defeat the jurisdiction of the county board it must be clearly shown, and in like manner found by the court, that the land embraced within the district is in fact such that, from some natural cause, it is nonirrigable, or is expressly exempted by statute from the operation of the law providing for the organization of irrigation districts, and the taxing of lands within the boundary of such district for irrigation purposes.—*Sowerwine v. Central Irr. Dist.* Supreme Court of Nebraska. 124 Northwestern 118.

CHANGE OF POINT OF DIVERSION.—

Where the property of a decreed appropriator of water of a stream abutted on both sides of the stream, and the headgate and main ditch were on the north side, the building of a flume from the south side across the stream and connecting it with the main ditch at a point below the headgate did not amount to a change of point of diversion, requiring compliance with the statutory provisions, since the flume was a mere lateral ditch.—*Diez v. Hartbauer*. Supreme Court of Colorado. 105 Pacific 868.

DUTY TO BRIDGE DITCHES.—

Under the provisions of section 3310, Rev. Codes, it is the duty of the county to construct bridges that are required to complete all roads intersecting ditches or canals laid out after the construction of such ditches or canals; but, when ditches or canals are constructed across an existing road or highway, one established by prescription or duly located by the county commissioners, then it is the duty of the owner to construct a proper bridge across such ditch or canal.—*MacCammelly, Road Overseer, v. Pioneer Irr. Dist.* Supreme Court of Idaho. 105 Pacific 1076.

RECEIVERSHIP OF IRRIGATION SYSTEM.—

Where a plaintiff alleges that it has acquired an interest in an irrigation system by the purchase of water rights therein, and the irrigation company owning such system becomes insolvent and is unable to protect and care for its property and comply with its contracts with the plaintiff to furnish water, the district court or the judge thereof has power and jurisdiction to appoint a receiver for such irrigation company to preserve and care for and operate its property pending the litigation as to the plaintiff's interest in said property.—*Idaho Fruit Land Co., Ltd., v. Great Western Beet Sugar Co.* Supreme Court of Idaho. 105 Pacific 562.

POLLUTION OF STREAM.—

Where a mill owner who had acquired the right to use waters artificially developed in working mines used it for milling purposes in concentrating ores, and after it had become impregnated with poisonous substances discharged it into the channel of a natural stream, to the injury of a land owner who had appropriated waters from the stream for irrigation long before any rights of the mill owner, attached, the mill owner was responsible in damages for injury to the land owner from the pollution of the stream.—*Humphreys Tunnel & Mining Co. v. Frank*. Supreme Court of Colorado. 105 Pacific 1093.

CONTRACT FOR IRRIGATION WORKS.—

Where a firm has a contract with the government for the construction of irrigation works, and receives payment from the government on such contract, and turns the money over to a creditor to be applied upon a debt due from such firm to such creditor, and it further appears that a third person made certain advances and loans to such contracting firm to aid them in carrying out their contract with the government, the payment made by such firm to its creditor will be deemed a payment by such firm, and not by the person advancing or loaning such money in aiding such firm to carry out said contract. *Porter v. Title Guaranty & Surety Co.* Supreme Court of Idaho. 106 Pacific 299.

ADVERSE USE.—

Defendant, having diverted the waters of a creek adversely to plaintiff under claim of right, and used the same on his land for many years, more than five years before action, sunk several wells in the bed of the stream, from three of which water, to the quantity to which he had previously obtained the right of adverse use, was obtained. Plaintiff had knowledge of such use, and knew that the flow in the creek immediately decreased, and by reasonable inquiry could have ascertained that the decrease was caused by the wells. *Held*, that plaintiff's right to object to defendant's use of the wells was barred by limitations. *Hudson v. Dailey.* Supreme Court of California. 105 Pacific 748.

DISCHARGE ON ADJOINING LAND.—

A person may not, except in the exercise of the power of eminent domain, lawfully concentrate surface waters and discharge them through an artificial ditch in unusual quantities upon lands of an adjacent owner, to his damage.—*Kane v. Bowden.* Supreme Court of Nebraska. 123 Northwestern 94.

SALE OF WATER.—

Where there was no assent by plaintiff to the use of water by defendant, a notice by plaintiff forbidding the use of the water, and demanding a certain sum for every day the notice was violated, was not a proposition to sell water at that rate. *Wessling v. Nye.* Supreme Court of California. 105 Pacific 409.

APPROPRIATION—QUANTITY.—

The beneficial use and the needs of the appropriation of water for irrigation, and not the capacity of the ditches, or quantity first run through them, is the measure and limit of the right of the appropriators.—*Whited v. Cavin.* Supreme Court of Oregon. 105 Pacific 396.

USE OF WATER.—

A lower riparian owner is not entitled to water which has been stored by an upper owner while the stream was running, unless such water also included water which the latter caught and stored by entirely obstructing the flow while the stream was running, to the former's damage.—*Stacy v. Delery.* Court of Civil Appeals of Texas. 122 Southwestern 300.

UNLAWFULLY DETAINING WATER.—

Where a lower riparian owner, suing an upper owner for unlawfully appropriating the water of a stream, alleged that the upper owner impounded the water of one of the forks of the stream, and the evidence showed that the damages complained of were caused by dams on the other fork of the stream, there could be no recovery, because the evidence did not support the petition.—*Stacy v. Delery.* Court of Civil Appeals of Texas. 122 Southwestern 300.

LIMIT OF APPROPRIATION TO PARTICULAR LANDS.—

Where an owner relied for his water rights on a diversion made through a particular ditch, he is limited in his use to the lands under that ditch which may be irrigated by water diverted through it or other ditches under it, and, while not necessarily confined to the same specific tracts upon which the water has theretofore been applied, he is restricted to acreage upon which the appropriation was perfected at the time of the inception of the water

rights of other claimants which did not exceed the number of acres previously owned by him.—*Whited v. Cavin.* Supreme Court of Oregon. 105 Pacific 396.

APPROPRIATION—FORFEITURE.—

Where application for an appropriation of water is made to the state engineer according to Laws 1903, pp. 88-100, c. 100, Secs. 1-42, giving him large discretionary powers with authority to extend the time that he has fixed for completing works required to perfect the appropriation and work is commenced within the statutory time and prosecuted in good faith and with due diligence, he may extend the time if not beyond the final limit fixed by the statute, although the application therefor is made after the time first fixed by him has expired.—*Pool v. Utah County Light & Power Co.* Supreme Court of Utah. 105 Pacific 289.

APPROPRIATION OF UNUSED WATER.

Where an original mill race appropriation was not needed by its owner for use, and was in fact not used, it was subject to appropriation and use by one diverting the water from the stream above its return point to the river. *Windsor Reservoir & Canal Co. v. Hoffman Milling Co.* Supreme Court of Colorado. 109 Pacific 425.

INJURY BY FLOWAGE.—

Defendant corporation undertook to divert water from the Colorado river near the boundary line between California and Mexico through canals for irrigation purposes. It contracted with a Mexican company, which it owned, and with other local irrigation companies which it organized in California, to deliver water to their canals and ditches. It constructed three intakes from the river, two of which were on Mexican territory on land of the Mexican company and nominally under its control, but which were, in fact, constructed and controlled by defendant. These intakes were so constructed without controlling gates that in a time of flood one of those in Mexico was so enlarged by washing that a large part of the water of the river poured through and passing through canals of the other companies overflowed and damaged, and finally destroyed the property of complainant situated in the Salton Basin below the level of the river. *Held*, that having sole control of the intakes, from the improper construction of which the damage resulted, defendant was responsible therefor, and that to a suit to enjoin further flooding and to recover for the damage done the other corporations were not necessary parties.—*The Salton Sea Cases. California Development Co. v. New Liverpool Salt Co.* U. S. Circuit Court of Appeals. 172 Federal 792.

IRRIGATION DISTRICTS.

Primarily the duties of water commissioners are to enforce the decrees of the various claimants to and users of water, from a common source, according to their terms, and where several ditches, irrigating by means of laterals out of a common channel, have the same point of diversion, a common headgate, and the same channel for some distance, the commissioners should turn out the water to satisfy the decrees under which the claimants are entitled, and the commissioners cannot refuse to do so on the ground of abandonment, or that the claimant seeks to apply the water decreed to his ditches in a new place, or to settle bona fide disputes as to the relative rights of the use of water under the decrees between the several claimants; but such questions should be left to proceedings between the claimants. *Boulder & Left Hand Ditch Co. v. Hoover, Water Com'r.* Supreme Court of Colorado. 110 Pacific 75.

IRRIGATION DITCHES.

Const. art. 1, § 16 and Laws 1899, c. 131, authorizing the taking of land for irrigation ditches, do not limit the right to owners of land devoid of agricultural value without irrigation. *State ex rel Galbraith v. Superior Court of Spokane County.* Supreme Court of Washington. 110 Pacific 429.

INCREASING ACREAGE.

Where the acreage irrigated under an appropriation of water has not increased materially for several years, an appropriation for additional acreage dates from the increased diversion. *Porter v. Pettengill.* Supreme Court of Oregon. 110 Pacific 393.

TO PROTECT FORESTS FROM DEVASTATING FIRES

By HENRY S. GRAVES, UNITED STATES FORESTER

THE losses from forest fires this year will be greater both as to number of people perished in them and the amount of timber destroyed than at any previous year.

In the lake states the summer fires which followed the late spring season are the worst ever known in that region. The total loss of life will probably never be known, but there are at this time known dead and missing of more than 200 persons.

Three departments of the federal government were called upon to help extinguish the conflagrations which have raged in the mountain states and through their heroic efforts great savings of life and property are to be credited, but the forest will not be saved until the fall rains and snow have once more made a wet blanket of the dry forest floor.

How such losses may be prevented is a matter of general public concern. To the national forest timber

at the fire; (2) an adequate force; (3) proper equipment; (4) a thorough organization of the fighting crew, and (5) skill in attacking and fighting fires. Quick access to fires is accomplished through the work of supervision and patrol in discovering fires before they have gained much headway, and by a well-developed system of communication through the forest by roads and trails.

How Fire May be Fought.

A small fire may be put out by one man, but in extensive forests several hours may pass before the fire can be reached. It is important to secure an adequate force of men, and to get them to the fire quickly. In a well-organized system of patrol the guard who discovers a fire communicates quickly to other guards and to headquarters by telephone, signal, or other means, and indicates the number of men he needs.



A Lookout Station, Cabinet National Forest.

burned must be added great amounts on state and private holdings, besides the immense damage done to town, farm and other property. Railroads have suffered from the interruption of traffic as well as from direct losses.

In some sections of the country forest fires have always been of such common occurrence that there is a popular notion that they can not be prevented. The risk from fires can never be entirely eliminated, for in the forest there is always inflammable material which is very easily ignited. They may, however, be largely prevented, and under efficient organization their damage may be kept down to a very small amount. The problem is like that in cities, where fires can never be entirely eliminated, but where the risk of loss to property may be reduced almost to insignificance.

The principles of fighting forest fires are essentially the same as those recognized in fighting fires in cities. The following are of first importance: (1) Quick arrival

The efficiency of the fire fighting crew depends very largely on their skill and experience, and particularly on the skill and experience of the man directing the work. It is not only a question of knowledge of how to assign each man where his work will be most effective, but there must be judgment exercised in determining the general method of attack. The character of the fire, the character of the forest, the condition of the atmosphere, the strength and direction of the wind, the rapidity with which the fire is running, and many other points have to be taken into consideration.

After describing how surface fires may be put out by beating, by throwing sand or loose earth, and by other methods, the account goes on:

Sometimes the front of the fire is so fierce that it is impossible to meet it directly. One method under such circumstances is to direct the course of the fire. The attack is made on the sides near the front, separating the

forward portion of the fire from the main wings. A part of the crew attacks the forward part and others run down and extinguish the wings. The front of the fire, attacked from the sides, is forced gradually and constantly into a narrower path.

Usually the front can be directed toward some cleared space, road, pond, stream, swamp, or fire line, when it will be checked enough to admit of a direct front attack. Sometimes by this plan the front may be rapidly narrowed by working from the sides, until it is at last entirely extinguished. The plan of giving direction to the course of the fire has often been successfully carried out when the fighting crew is too small for a direct attack.

When fires gain such headway that it is impossible to stop them by direct attack, no matter how numerous and efficient the crew or complete the equipment for fighting, back firing becomes the only means of stopping the fire. It should, however, be used only when it is absolutely necessary. One of the commonest mistakes in fighting fires is to overestimate the rapidity of the fire and the

wings with the ordinary methods of fighting. It is necessary to attack the wings at once, particularly if there is a strong wind, for otherwise each wing of the old fire would soon form an independent fire with a well-developed head. It is necessary, also, that a number of men be stationed where the original fire and the back fire meet in order to extinguish smoldering fires in tops, logs, and other debris.

Damage by Fires.

The damage done by forest fires may be discussed under the following heads:

(1) Death of standing trees, (2) injury to trees that are not killed, (3) injury to the soil, (4) reduction of the rate of growth of the stand, (5) effect on reproduction.

Crown fires kill outright most of the trees in their paths. In a severe crown fire the foliage of coniferous trees is completely consumed. Hardwood trees in mixture are generally so badly scorched that the buds, leaves, and living tissues in other finer parts of the trees are killed, if not consumed, by the heat. Sometimes, however,



A Favorable Condition for Burning Piled Brush.

difficulty of putting it out. A forest fire is always a frightening spectacle, particularly if it is sweeping in the direction of one's own property. Men often become excited and start back fires when it is entirely unnecessary. Back firing necessarily involves deliberately burning over property. When this belongs to another person and one's own forest seems in danger, there is a great temptation to sacrifice it.

If it is found that a back fire is necessary, a favorable point is selected directly in front of the fire, from which to set the new fire. This must be a point where it is safe to start a back fire, such as a road, fire line, stream, or swamp. The leaves are ignited at points five feet to a rod apart for a distance not greater than the estimated width of the head of the fire. These small fires gradually meet and form a continuous line, eating back against the wind. A part of the crew is stationed across the road or other break from which the back fire is started and put out at once the small fires which may result from the sparks blown over from the back fire.

The meeting of the two fires stops at once the head of the main fire. It is usually possible then to attack the

where the fire burns somewhat irregularly—as, for example, where there are a good many hardwoods in mixture or the fire is broken by irregularities in topography—single trees or groups of trees often escape injury.

Ground fires, also, usually kill all trees in their way, for although they burn very slowly, they generate a great volume of heat and kill the living tissues of the roots. Sometimes the injury is not apparent above ground, at all, but the trees die and after a time are blown over, because the roots have been killed and weakened.

Surface fires kill seedlings and young trees with tender bark, but in a great many cases do not kill outright the larger trees. Nevertheless, a very severe surface fire may kill everything in its path, and, not uncommonly, hardwood forests are entirely destroyed by fires which do not at any time assume the character and proportions of crown fires.

The presence of dry tops and piles of brush, in the forest constitutes the greatest menace from fires. The severity of a fire, and hence the damage done, is in direct proportion to the amount of dry debris on the ground. Still more serious is the fact that the presence of this

material makes it exceedingly difficult to control and extinguish a fire. If there is no material on the ground other than the ordinary leaf litter, a surface fire may be easily extinguished. Old logs, dead and down trees, and snags lying about on the ground are also a great hindrance to fighting fires, for when once ignited they are apt to smolder for long periods, and so continue to threaten a further spread of the flames. In many of our forests the dead, standing snags constitute a dangerous feature. If these are surrounded by a dense stand of conifers, they often carry the flames up into the canopy and make a crown fire; if isolated, they may burn for days, and finally fall throwing sparks in all directions. The forester aims to reduce the amount of this inflammable debris in a forest as rapidly as possible, since the "clean" stand is easy to protect in comparison with a stand that is littered with dry debris.

Disposal of Brush and Debris

A first practical step is to prevent a further accumulation of debris in a forest by disposing of the slash from new cuttings. The application in all forests of a uniform



Lodgepole Pine Damaged by Fire.

method for disposing of this material would, however, be unwise. It should be clearly understood that no fixed rule of procedure and no single method could possibly fit all the different forest conditions in a country so large as the United States. The method used in any given case must be chosen after a careful study, and must rest upon a complete knowledge of the local conditions. Many methods have been tried in the disposal of brush, but those producing the best results are the following:

- (1) Piling and burning as logging proceeds.
- (2) Piling and burning in separate operations.
- (3) Lopping the tops.
- (4) Lopping the tops and scattering the brush.
- (5) Broadcast burning.

Burning Brush in Making Fire Line.

An excellent time for burning brush is after the first snow of winter. This is usually a light fall, and the snow does not penetrate the compact piles of brush sufficiently to prevent burning. There is no danger of the fire running on the ground, and the branches of the standing trees are so damp as to prevent injury by the rising flames.

If the brush is burned before winter, it should be only during damp weather, when the ground is so wet that fire will not run easily.

Special fire lines may be classed under the following heads: (a) Fully cleared lines; (b) tree-cleared lines; (c) ground-cleared lines.

The ideal fire line is a completely cleared strip, from which are removed not only the trees and brush but also all ground debris down to the mineral soil.

Fully cleared lines are advisable when the risk of fire is very great, and adequate protection can be secured only by having a clear break which will either stop or check possible fires. Such lines are necessarily expensive to construct and maintain. They are, therefore, used only when the property is valuable and the damage from a fire would be very great, as, for example, to protect nurseries, plantations, or valuable blocks of timber.

By a tree-cleared line is meant one from which the trees and brush are removed, but from which no effort is made to clear the leaves or other small litter. The object of such lines is not to stop a fire, but to furnish a vantage ground for patrol and for fighting fires.

By ground-cleared lines are meant strips on which the small brush and ground debris are destroyed, and the large trees are left standing. Ground-cleared lines may be made in open woods, where there is little or no undergrowth to be injured or to interfere with the work of clearing the ground. The usual procedure is to burn a strip through the woods from 10 to 20 feet wide. This can be done only where the conditions are such that a surface fire may be controlled and restricted to the desired strip.

(Continued from page 604.)

The Success System of Sub-Irrigation can be installed at a cost of about \$20. per acre.

The porous tile in this system is made of practically indestructible material and with proper care it becomes a permanent feature and continues from year to year to increase the value and productiveness of the land in which it is installed. The tile is intended for sub-irrigation and surface drainage and is laid in the ground so as to carry the water in a continuous line of tiling by an uninterrupted flow by force of gravity from a tank at a high point of land to a well or other natural source from which the water is had primarily. The surface of the soil remains intact, there is no waste of land and all the water which does not escape into the land is saved.

Government reports show that 72 per cent of the water used in surface irrigation is lost by evaporation. By this system of sub-irrigation there is no loss by evaporation.

Under this system the water is filtered before it enters the tiling thus preventing any chance of clogging. The tiling used in this system is so constructed as to permit of its being closely and snugly fitted together at the ends, making a solid and continuous line of pipe and rendering it safe from all danger of being stopped up by outside influences.

The porous substance of which the Success sub-irrigating tile is made, permits water to pass through it like perspiration through the pores of the human skin, but there are no openings in this tile where dirt and roots can get into it. This tile will effectively drain the land when it becomes too wet and will fill the land with moisture when it becomes too dry and will make the farmer a manufacturer with the material in his hands to produce the most perfect results of the soil regardless of whether it rains or not.

In the Saturday Evening *Post* of July 9th is a long article descriptive of the wonderful results produced by sub-irrigation in Florida. It is shown that land which sold ten years ago for fifty cents per acre and which has since been sub-irrigated, is now selling for one thousand dollars per acre, and as high as \$2,100 per acre net profit has been produced on a single acre of this land in one season.

With the Success sub-irrigation system similar results can be produced on the lands of any state, and as soon as a sufficient number of acres are sub-irrigated in the vicinity of any of our towns, land values will increase, bank deposits and general business will grow, and canning factories, cold storage plants and better marketing facilities will result as a natural consequence.



70-Acre Cherry Orchard on the Fountain Valley Land and Irrigation Company's Project.

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This tract is located between Colorado Springs and the town of Fountain. The section is world famed as a health resort—many of the larger fraternal organizations of the United States have established homes for their ailing members at or near Colorado Springs.

The Fountain Valley tract is, moreover, particularly favored and its superiority pronounced by the fact of its fine markets. Colorado Springs, Manitou, Cripple Creek, Victor, Colorado City (points directly connected with this tract), and other mining markets, to which Colorado Springs is the gateway, such as Leadville, serve, altogether, a population of over 200,000 people. This is in addition to the annual gathering of tourists at or near Colorado Springs, estimated at something like 200,000 people. Aside from the Fountain Valley, all of these places must secure their supplies from distant points, such as Greeley, through Denver on the north, or from the lower Arkansas Valley, through Pueblo on the south, thereby giving Fountain Valley a great advantage in the matter of freight rates. This valley competes successfully in the markets of Denver and Pueblo.

Alfalfa in the Fountain Valley yields larger returns in money than any other known place in the world, due to the superior markets.

Land may be purchased in this delightful section at reasonable prices and on favorable terms.

For finely illustrated folders fully describing this section, address

**The Fountain Valley Land and Irrigation Company
Colorado Springs, Colorado**

Reclamation Notes

CALIFORNIA.

I. W. T. Boulware of Biggs, has sold 1,200 acres of land near Bangor to F. M. Turner for \$11,000. The sale comprises a tract of land lying under the Wyandotte Land & Water Company's ditch. Mr. Turner will sub-divide his land and sell it in small orchard tracts.

For the purpose of carrying on the work of reclamation in district No. 108, an assessment of \$125,000 has been levied on the land owners of the district. This district embraces land lying near Colusa.

The survey from Eagle Lake to Honey Valley for an irrigation system has been completed. The lake will be tapped and thousands of acres of land lying in the vicinity of Merrillville and be placed under water.

The directors of the Modesto Irrigation district held a meeting recently and received a petition signed by a majority of the property owners in the district, and covering more than a majority of the property valuation, asking that an election be called to vote a fund of \$50,000 for the purpose of completing the foothill reservoir. A meeting was called for November 4th. It is estimated that \$50,000 will more than pay for the completion of the reservoir which will be ready for water early in the spring.

The Solano-Yolo Land & Water Company of Dixon, have perfected plans whereby 40,000 acres of land lying in the vicinity of Winters and Dixon will be brought under irrigation. This project involves the construction of a large dam at Devil's Gate, a deep gorge in the Putah Creek Canyon, above Winters. Those interested in the project are C. M. Wooster and Charles Cunningham of Dixon and W. A. Beard of Sacramento.

A suit involving the validity of bonds issued by Peris Irrigation district in Riverside county has been filed by Amelia S. Quinton and other property owners who ask the court to declare the bonds invalid and restrain the Equitable Investment Company, a Maine corporation, and others, from prosecuting the former action. It is alleged that the bonds were illegally issued.

Col. E. S. Weeden of New York, has purchased a Keystone drill and installed it on his ranch, three miles from Tres Vias. The drill will bore for water until a flow of sufficient volume is encountered to place the land under irrigation.

A suit to condemn rights-of-way for an irrigation system has been brought in the Superior court of Tehama county against the Central Pacific Railroad Company, the United States Trust Company of New York, and other defendants. The plaintiff is the Sierra Irrigation Company of Tehama. The right-of-way desired is to be 100 feet wide and commences at a point on the west bank of Mill creek, near Lyonsville, and runs southwesterly to section 22, township 27 north, range 2 east, where a power house is to be built.

It is reported that the Natomas Consolidated of Sacramento, organized a couple of years ago with a capital of \$25,000,000, has purchased from time to time the tracts of land lying between Mahew station and Folsom, east of Sacramento, aggregating 37,340 acres, and that the bulk of this land will shortly be brought under irrigation and developed into one of the finest colonization enterprises ever attempted in the west. Water for irrigating the tract will be carried from the American river. The land will be planted to fruit.

A new irrigation district comprising 2,550 acres of land lying east of the Pearson district and north of the city of Courtland has been established.

The Iowa Land & Water Company, of which Chas. H. Kegley is president, and M. J. Nolan, secretary, and which owns 9,000 acres of land on the main line of the Santa Fe railroad at Solita, has completed its irrigation system at a cost of \$100,000. This water system is composed of thirteen artesian wells with a perpetual uniform flow of about 3,000 minor inches.

The Mohave River, Land & Water Company of San Bernardino has filed articles of incorporation, capital stock \$500,000. The syndicate has filed upon 60,000 inches of water, and twenty-one good land locations. The incorporators are: L. M. Holt, J. T. Tibbott, G. W. Wilcox, J. W. Badger and H. J. Backus of Los Angeles, and Geo. A. Cleveland of Ocean Park. The land to be reclaimed lies between Otis and Daggett.

COLORADO.

The Chicosa Park Land & Irrigation Company has filed articles of incorporation with a capital stock of \$100,000. The incorporators are: Jos. H. Loor, Robt. T. Frazier and Edwin B. Haver. The headquarters of the company are in Pueblo.

It is reported that Bulkeley Wells and associates are preparing to start the survey for their big irrigation system on the San Miguel river, near Norwood. This project when completed will water 40,000 acres of land.

The completion of the old Bent-Prowers irrigation project is practically assured. The storage reservoirs for the system will be located about 18 miles south of Las Animas, on the Purgatoire river, and the district to be irrigated lies between Rule and Clay creeks, and from five to ten miles south of the Arkansas river. About 100,000 acres of land in the vicinity of Lamar will be brought under irrigation by the Bent-Prowers system, which will cost in the neighborhood of \$4,000,000.

At a directors' meeting of the Denver-Greeley Valley irrigation district held recently, six and one-quarter sections, five miles east of Hudson, were voted into the district. This makes a total of 60,000 acres in the district, which is the required number the bond issue is to cover.

Directors of the Greeley-Poudre irrigation district are negotiating with B. D. Sanbourn for the purchase of preferred water rights out of Boyd lake, which the latter owns.

Plans are on foot to take water from Lake Loveland, Seven Lakes and Boyd Lake to water 10,000 acres in the eastern part of Weld county, a distance of fifty miles.

IDAHO.

K. L. Molen and R. E. Kutler of Hailey, have filed a claim of lien against the Big Lost River Irrigation Company for \$1,407.20 for services and labor performed upon the canal known as the "Lower North Canal," used for irrigation of the Powell tract.

Hale & Crane, sub-contractors on the Idaho Irrigation Company's works under the J. G. White Company, have filed a claim of lien against the last named company to recover \$56,191.84, balance alleged due them.

The Blaine County Canal Company has filed articles of incorporation with its main office at Arco. The capital stock is named at \$20,000, in \$1.00 shares.

Bids for the work on an irrigation project comprising 22,000 acres lying in the vicinity of Salmon City are now being submitted. This is a Carey Act project and is being

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The "American" double acting water cylinders deliver full cylinder displacement capacity both on the up-stroke and the down-stroke.

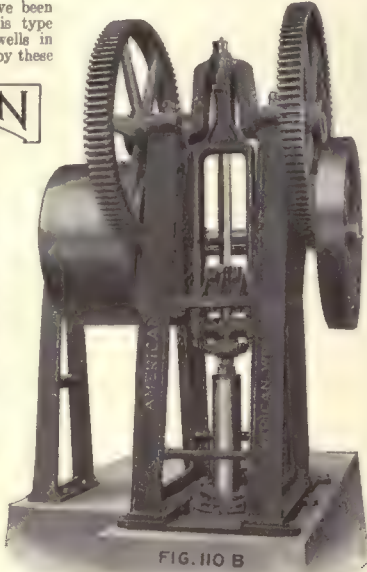
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incorporated by John N. Kirk and other Butte capitalists. There will be nine miles of main canal and nine miles of laterals, with reservoir dams on Timber and Eight mile creeks.

The Hansen Brothers of Blackfoot, have filed a claim of lien against the Corey Brothers Construction Company and the Big Lost River Irrigation Company for \$1,501.13, with interest at 7 per cent per annum, balance due them for labor done on the Big Lost river canals.

NEW MEXICO.

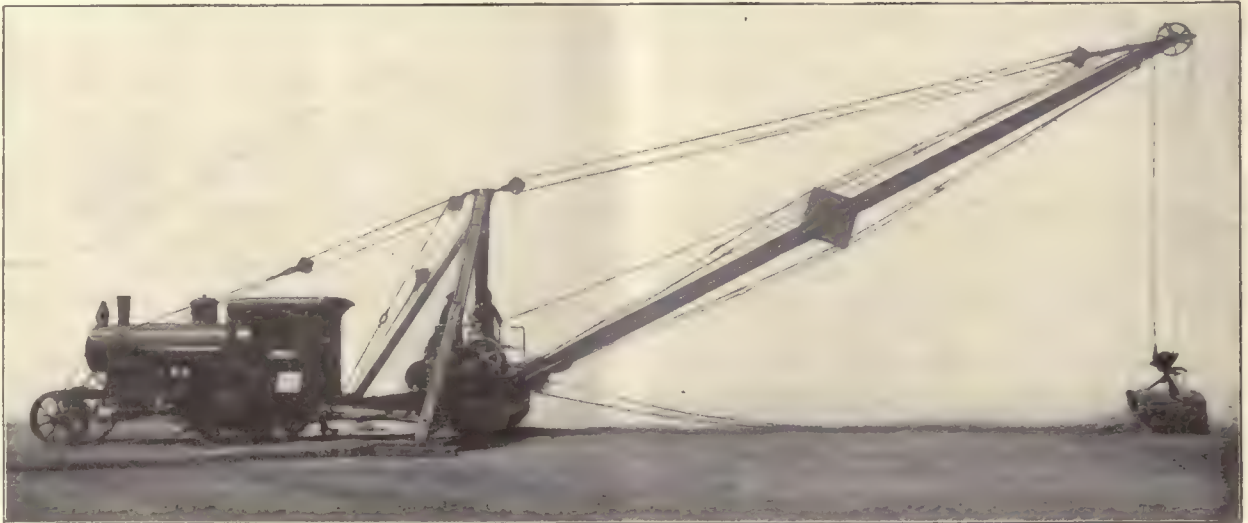
Territorial Engineer Sullivan has approved the application of the Bocas Irrigation Company of Albuquerque for the water of the Abo Canon in the Manzano mountains, for the reclamation of 20,000 acres of land just outside the Belen grant in the Rio Grande Valley, although the waters of Abo canon are not tributary to the Rio Grande. The project involves the construction of two dams, creating reservoirs holding 20,000 acre feet. One dam will be 85 feet high, 670 feet long on the top and 150 feet at the bottom. The other will be 94 feet high, 487 feet long on the top and 160 feet at the bottom. The former will be of rubble masonry and the other of reinforced concrete. The estimated cost of this project is \$175,000.

T. J. Imboden who has a claim six miles north of Mountainair, is putting down a well 100 feet deep as he will do some irrigating next year. He has secured a 4½ H. P. engine but is undecided as to what kind of a pump to use.

The voters of Logan and vicinity held a meeting on September 20th and voted unanimously to organize an irrigation district. W. F. Weber, C. W. Abernathy and R. L. Smith are the directors.

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This is the latest and most original machine built in the Steam Shovel Line.

It has three very great advantages: **First**—it requires no track to run on; **second**—moves from one job to another can be made quickly and without the heavy expense of having to tear the engine outfit to pieces; and **third**—in buying this outfit you not only get a splendid Steam Shovel Outfit but a complete Traction Engine as well, which you can use for all kinds of Traction and Belt Work.

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OREGON.

Plans and maps have been filed with the Secretary of State for the Pine Creek Irrigation project, which will reclaim thousands of acres of land lying in the vicinity of Weston. Water will be taken from Pine creek. A dam 200 feet high will be built three miles above Weston.

The lands under the Silver Lake irrigation project, ten miles northwest of Summer Lake, are to be thrown open by the Department of the Interior on November 26th, but will not be subject to entry, filing or selection until December 26th, at the United States Land Office in Lakeview. The project embraces about 19,000 acres of land and the soil is considered very good.

State Engineer Lewis has approved the government's filing on rights for irrigation of the 60,000 acre tract adjoining the Umatilla project, known as the East Umatilla project. The government must start actual work by September 15th, 1911, or the filing of Andrew Smith, of Portland, which is next in priority of time, will be taken up by the board of control. Under the permit granted the government is allowed to use 600 cubic feet per second of the regular flow of the Umatilla river, with the addition of 175,000 acre feet storage to be taken from surplus flood water of the Umatilla river. The low water flow of the river will be supplemented by a storage not to exceed 1-80 of one cubic foot for each acre irrigated. The total limit of water procured under the filing is 748 cubic feet per second.

Tassey Stewart of Umatilla has purchased 700 acres of land in the Poe Valley and will install a pumping plant with which to irrigate his land. At a cost of about \$2,000 he expects to irrigate the entire tract.

S. W. Gould of Vale, is spending \$20,000 on one of the largest private irrigation enterprises in Malheur county. The lands to be watered lie near Skull Springs. The concrete dam will store enough water to irrigate from 1,500 to 2,000 acres of land.

State Engineer Lewis has approved the application of Fred M. Cummings for a waterright to irrigate 55,000 acres of land in the Rogue river valley in the vicinity of Medford. Four-Mile lake and Fish lake will be transformed into storage reservoirs for storing water to irrigate the land. Work on the project will be started immediately.

The Warner Valley Land and Irrigation Company have applied for the segregation of 150,000 acres of land, a part of which the company caused to be withdrawn from entry last fall under the Carey Act. The company has a watershed of about 800 square miles, and plans to take water from a reservoir to be built at a point where Honey creek leaves the hills of the Warner mountains and flows to the Warner chain of lakes. The plans of the project also cover the pumping of water from Warner or Flagstaff lake by electricity.

The Lone Pine Reservoir and Irrigation Company has filed articles of incorporation with the secretary of state. The capital stock is \$10,000 and the principal office of the company is at Mabton.

Contracts for the disposal of the Hatchtown reservoir irrigation project have been signed by the State Board of Land Commissioners. Lloyd Sigler, manager of the National Bond and Trust Company guarantees to dispose of the land at prices which will net the state 5 per cent on its entire investment on the project. The ditches have been completed and the water turned on.

The reclamation of 106,880 acres of land in Grand county is planned by the Grand Mutual Development Association of Denver. An application for 100 cubic feet per second of the flow of Grand river has been filed by this company with State Engineer Caleb Tanner. The



No. 3. Traction Gasoline Machine crossing the high Sierras of Eastern Washington, where fuel and water are not to be had. We made the 25 mile move in 8 hours, using 20 gallons of gasoline at 19c per gal. We had no team nor needed any. The one in the picture did not belong to the machine.

THE DESERT DRILL

This is a Standard KEYSTONE Traction Cable Drill driven by a two cylinder double opposed gasoline engine. Size 3 has a 22 H. P. engine and is guaranteed for 500 ft. depths. Size 5 has a 30 H. P. engine and is guaranteed for 1000 ft. with manilla cable or 1500 ft. with wire line.

Requires no fuel but gasoline.

Requires no water except for cooling engine and a little for the hole.

Will go anywhere on its own power.

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No. 3 Traction Gasoline Drilling in Eastern Washington, using 500 ft. of 2 1/4 in. cable and cutting 10 in. hole. Has 28 ft. string of tools with 3/4 x 22 ft. stem. This drilling was all hard basalt boulders and our best day's work was 50 ft., using 15 gal. of distillate at 13 cents per gallon.



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ESPECIALLY ADAPTED to IRRIGATION WORK. Has Low Feed, Automatic Loader, and is Easily Portable. SELF-PROPELLING if desired. This machine is replacing all others because it "delivers the goods" with such remarkable efficiency and is so much nearer indestructibility than any other mixer ever made. Study the four "spotlights." See the bearings of

STANDARD ROLLED STEEL RY. RAILS

running on **FLANGED CHILLED STEEL CAR WHEELS.**

"Adapt your outfit to your job, not the job to your machine."

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484 Old Colony Bldg., Chicago Hudson Terminal Bldg., New York

water will be taken from Grand river at a point near Cisco on the line of the Denver & Rio Grande Railroad.

E. J. Jeremy of Salt Lake City has filed an application with the state engineer for six cubic feet per second of the flow Green in Wasatch county, for the irrigation of 160 acres of land.

H. D. Boyle of Parowan has filed an application with the state engineer to appropriate $\frac{1}{2}$ cubic foot of the waters of the Cottonwood Canyon stream in Iron county, for irrigation purposes.

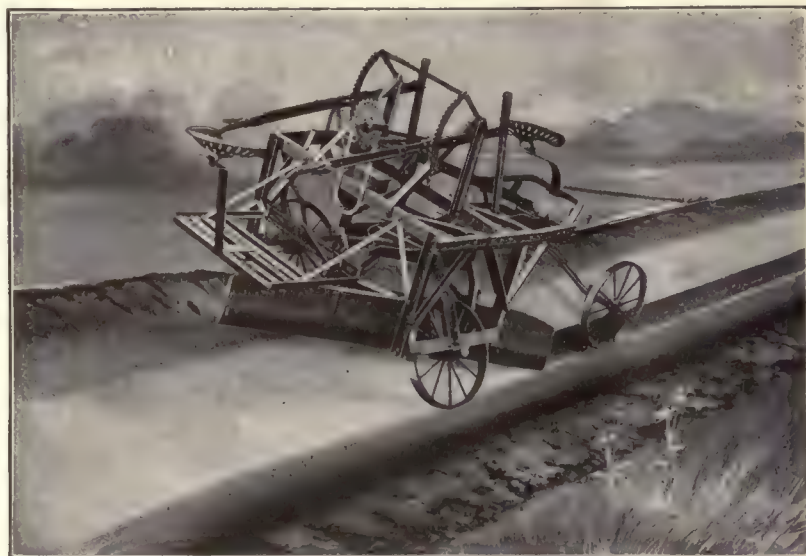
Jacob Magleby, of Monroe, has filed an application with the state engineer for six cubic feet per second of the flow of Monroe creek, to be used for irrigation purposes. The diverting canal will be over five miles in length.

The Fool Creek Irrigation Company has filed articles of incorporation with a capital stock of \$24,000. The office of the company is located at Leamington.

The cost of putting 31,000 acres of the Klamath project under irrigation has been fixed at \$30 per acre, and this is to be paid in ten annual installments of \$3 an acre each. The maintenance charges are fixed at 75 cents per acre annually, the total amount of the payment being \$121,500.

H. Rabbes and Wm. Wagner of Klamath Falls, R. F. Tuttle, C. D. Chorpeneing and W. J. Duncan of Bonanza, have begun work on a large private irrigation project. These parties own about 3,000 acres of land in the Langell Valley and have purchased a reservoir site of 160 acres at the head of the valley. A company will be formed, with the above named parties as incorporators, and work will be rushed to completion before winter sets in so that they may have water for next year's crops. They figure that they can irrigate these 3,000 acres at less than \$15 per acre.

The Little Roadster Grader and Ditcher



THE LITTLE ROADSTER

A New, Light Ditch Plowing Machine, Especially Designed for Cutting Small Laterals on Irrigated Farms, and Ditching and Grading Roads.

This type of machine cuts ditches for less money than any other tool or machinery, because it plows the dirt out of the ditch with one continuous motion, whereas all other ditching machinery or appliances must pick the dirt up and lift it out of the ditch and then dump it.

The Little Roadster is a practical plowing machine, being built with adjustable leaning wheels or rolling landsides which counteract the side pressure of the earth on the mold, the same leaning wheel principle which is used in the sulky plow.

It is made almost entirely of wrought steel and the few castings that are used are malleable and all parts are put together so far as possible with hot driven rivets, so that while it is a light machine weighing about eleven hundred pounds, it is exceptionally strong and rigid. It is designed primarily for two horses, although four may be used.

EVERY IRRIGATED RANCH OR FARM NEEDS ONE OR MORE OF THESE MACHINES. IT WILL QUICKLY PAY FOR ITSELF. SEND FOR DESCRIPTIVE FOLDER AND LET US TELL YOU MORE ABOUT IT

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The Rogue River Valley Canal Company, composed of Spokane capitalists, has recently acquired the holdings of the Fish Lake Water Company, and propose to irrigate 45,000 acres of land in the Rogue River Valley, near Salem. The old company owned 60 miles of canals and ditches, and the new owners will build an additional 40 miles of canal and 400 miles of laterals. The company owns water-rights in Fish Lake with a storage capacity of 55,000 acre feet of water, in addition to the running water in the north and south forks of Little Butte Creek. It is estimated that it will require \$2,000,000 to complete this project.

The Klamath Development Company has purchased a tract of land, known as the Altamont ranch, comprising 1,200 acres, about two miles from Klamath Falls, and will sub-divide it and place it on the market in small tracts. It is all under irrigation and is adaptable for truck gardening.

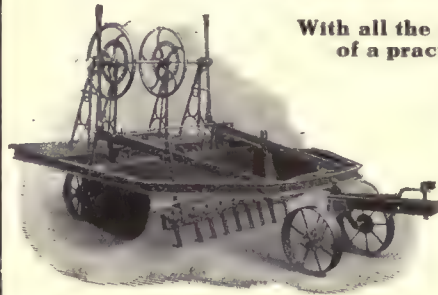
The Snake River Irrigation District, Ltd., have perfected plans whereby 12,000 acres of land lying two miles west of Ontario, and on the north side of the Malheur River and west of the Snake River, extending to a point opposite Wesier, including the famous Dead Ox flat, will be placed under irrigation. These lands are to be irrigated by means of current wheels, to be installed in the Snake River, the wheels to be run by power. The plan of the company is to install two of these pumping wheels in the Snake River, one of which will be at the mouth of Jacobsen's Gulch, five miles north of Ontario. One of these plants will lift the water 46 feet above the river; the other plant will lift the water 103 feet above the river.

UTAH.

The Uinta River Irrigation Company of Uinta has filed an amendment to its article of incorporation giving the company the right to assess its capital stock.

N. T. Porter of Salt Lake City has filed an application with the city engineer for the use of 10,000 acre feet

THE LITTLE YANKEE A REAL IRRIGATION MACHINE



With all the features
of a practical

Grader
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Cut showing diggers and fenders attached. These can be removed and the blade set for lateral ditching in five minutes.

BLADE COMPLETELY REVERSIBLE
WHEELS FITTED WITH FLANGED RIMS AND
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Lightest draft. No weight on horses' necks. A "snap" for teams and operator
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The first item of expense is the only expense; a good well is inexhaustible and lasts for all time.

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of water from Strawberry Creek, Swain's Creek and Kanab Creek, Kane County, for the purpose of irrigating 10,120 acres of land.

The L. Skeen Land & Livestock Company of Ogden has filed articles of incorporation with the county clerk,

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for the purpose of promoting irrigation throughout Weber County. Lyman Skeen of Plain City is at the head of the company, which is incorporated for \$100,000, with shares at \$1 each.

O. G. Berglund of Gunnison has filed an application for the use of enough water from Cottonwood Spring to irrigate 2,000 acres of land in the Cottonwood Canyon.

The St. Joseph Water & Irrigation Company of Salt Lake City has filed articles of incorporation and proposes to irrigate a large tract of land in Davis County. The water will be taken from the Salt Lake Gravity outlet sewer and from Hot Springs Lake in Davis County. The St. Joseph Land Company has also filed articles of incorporation and will undertake the exploitation of the land owned by the first named company.

Representatives of the Brown & Sanford Irrigation Company and officials of Salt Lake City have come to an agreement relative to whether or not the irrigation company was entitled to the water made by it in excavating in Big Cottonwood Canyon to increase the flow. The irrigation company procured the right from the government to place dams in the lakes to increase the amount of water. In excavating to do this the irrigation company went down below the natural surface to get foundations for its dam. The question then arose as to whether the irrigation company was entitled to the water below the natural surface. At the meeting held recently the representatives of the irrigation company agreed that they were not entitled to this water, and a written agreement was entered into between the city and the irrigation company.

WASHINGTON.

John S. Malloy and associates, of Spokane, have just completed the Post Falls project, which will reclaim 3,500 acres of land in the Spokane Valley, twenty miles from Spokane. Water is taken from Hayden Lake by a pumping plant having a capacity of 19,000,000 gallons of water per minute, and is delivered to the land in forty-two inch mains, a distance of four miles. The cost of this project is said to have been \$200,000.

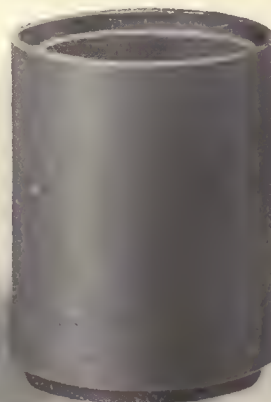
Gordon Mackay, who has a ranch near Olympia, has purchased a pumping plant from Mitchell, Lewis & Staver of Portland, with which to irrigate his orchard. The

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Well Made Cement Tile "THE TILE THAT LASTS"



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AND
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Miracle Tile Molds are easy to operate and produce 100% perfect tile.

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CHICAGO

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water system will deliver 2,000 gallons per hour. This is the first time that a large irrigated orchard has been attempted in this part of the state and the outcome of the experiment is being closely watched by the farmers and orchardists in the neighborhood.

Articles of incorporation have been filed by the Chelan Falls Irrigation Company. The main office of the company is located at Chelan Falls. The capital stock is placed at \$50,000. The incorporators are Geo. D. Brown, L. L. Brown and Fred E. Ripley, all of Chelan Falls.

The Secretary of the Interior has authorized the Reclamation Service to complete by force account the portion of Sulphur Creek Wasteway, Sunnyside irrigation, Washington, which was included in the contract of H. W. Hawley, of Seattle. The Hawley contract was suspended on July 2 by the Director of the Reclamation Service on account of the failure of the contractor to comply with the terms of the agreement.

Work on the pipeline for irrigating the valley between Huntsville and Waitsburg has been commenced.

Schuelby Brothers of Chattaroy, have purchased 160 acres of land near that town. This land will be divided into five and ten acre tracts and placed on the market.

Work on the 2000 acre reclamation project near Starbuck is progressing rapidly under the supervision of Pres. E. A. Bryan of the Washington State College, and will be ready for marketing by October 1st. Two centrifugal pumps having a capacity of 1,500 gallons of water per minute are being installed, and a gigantic reservoir is being constructed. A concrete pipe line is being laid and most of the power poles are in place. Power will be secured in the Tukanon river near Grage city. The land will be divided into five and ten acre tracts and will be planted to orchards.

MISCELLANEOUS.

A. M. Wagner of Seattle, Washington, has asked the Superior Court for the appointment of a receiver for the Columbia River Irrigation & Orchard Company, on the ground that he has purchased a tract of land from the company under an agreement to furnish water for irrigation, and that no water has been furnished.

The Pasco Reclamation Company has completed a project for the watering of 60,000 acres of land in the vicinity of Pasco, Washington.

Under the direction of Engineer David Hayes of Reno, Nevada, who is also connected with the Truckee-Carson irrigation project, two concrete dams are being built on the Humboldt river, in Humboldt county, by corporations having land to irrigate. One dam is five miles west of Lovelock and the other is being built at Mill City. As a result of these dams being built many thousands of acres of land will be irrigated next season.

More than 600,000 acres of land lying along the Rio

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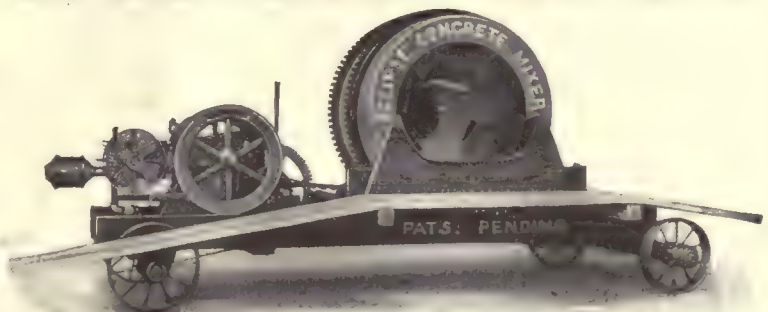
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The *Irrigation Age* has established a book department for the benefit of its readers. Any of the following named books on Irrigation and Drainage will be forwarded, postpaid, on receipt of price:

Irrigation Institutions, Elwood Mead.....	\$1.25
Irrigation Engineering, Herbert M. Wilson.....	4.00
The Primer of Irrigation, Anderson.....	2.00
Irrigation and Drainage, F. H. King.....	1.50
Irrigation for Farm and Garden, Stewart.....	1.00
Irrigating the Farm, Wilcox.....	2.00
Practical Irrigation, Aug. J. Bowie.....	3.00
Practical Design of Irrigation Works, W. G. Bligh	6.00
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Road Preservation and Dust Prevention, Wm. P.	
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Practical Farm Drainage, Chas. G. Elliott.....	1.50
Drainage for Profit and Health, Waring.....	1.00
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The Irrigation Age Company,

112 Dearborn St., Chicago, Ill.

Grande extending from Matamoras to the San Juan river will be brought under irrigation by the proposed canal system of the La Compania Agricola la Sautena, which has its headquarters in Mexico City, Mexico. The main canal will be 63 miles long. The system will require the building of over 200 miles of laterals. A dam will be constructed across the San Juan river. It is estimated that this project will cost \$10,000,000 gold.

On October 22nd, 14,939.25 acres of land under the Carey Act will be open for entry by the Great Falls Land and Irrigation Company, composed of Chicago capitalists. This land is near Augusta, Montana, on the Fort Shaw reservation. The land will be opened by drawing and registration. Water will be delivered to the land on or before June 1st, 1911.

Dwight Bushnell, of Twin Bridges, Montana, and associates from Helena, will reclaim a large tract of land near Twin Bridges. Work on the main ditch was commenced on September 25th.

It is stated that an irrigation district embracing the land lying between Stratton, Nebraska, to the South Fork, is practically assured. J. W. Smith, of Stratton, who is in close touch with the promoters of the district states that surveys have been made and that blue prints will be ready for examination by the middle of October.

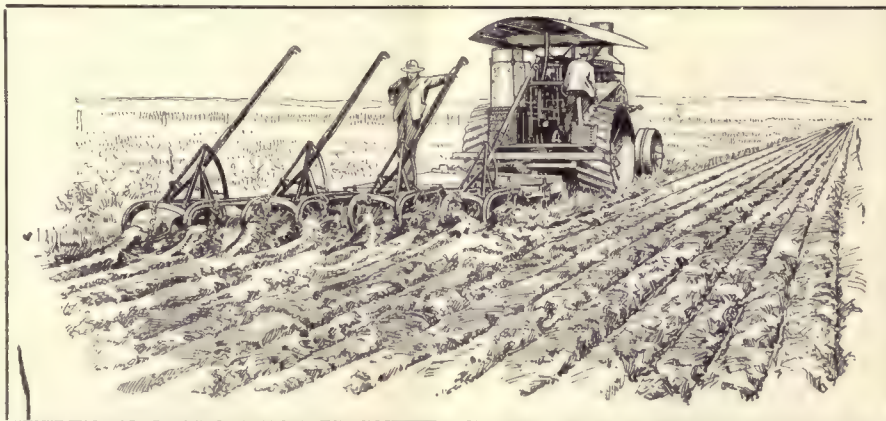
W. B. Dunlap, of Beaumont, Texas, has purchased the Farmers' Canal Company property from Receiver Wynne. The plant consists of 18 miles of irrigating canals, laterals, rights of way, telephone system and other property. The canal is located in Chambers county, Texas, and the price paid for it was \$40,000.

The Colorado-Wyoming Development Company has filed articles of incorporation with a capital stock of \$2,500,000, with their principal office at Cheyenne, in charge of Ex-Governor F. Chatterton. The plan of the company

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for this project comprises a large reservoir to be located near the state line. This is to be fed by the Platte river. Work will be started on this reservoir during the present month.

The Bell & White Land, Engineering and Development Company of Guthrie, Oklahoma, have filed an application with Secretary Frank Field of the State Board of Agriculture, for permission to take water from the Cimarron river to irrigate 100,000 acres of land in Cimarron county. It is estimated that the cost of the project will be \$40,000.

The surveys for the new irrigation system of the Lake Shore and Union Canal Ditch companies has been completed and construction work will start in the near future. This dam will furnish water for the reclamation of land in the vicinity of Lovelock.

Reports from Laredo, Texas, state that preliminary steps have been taken toward the establishment of a large electric power and transmission enterprise on the Rio Grande river, at a point thirty-six miles above Laredo. This syndicate will furnish power for irrigation pumping plants on both sides of the Rio Grande river for a distance of 100 miles along the river. It is estimated that the project will cost over \$2,000,000. The initial capacity of the plant will be 50,000 horse-power.

Dr. G. H. Parham of Necedah, Wisconsin, has installed a small irrigation system on his farm near that city to irrigate his growing crops. A dam has been built across the drainage ditch, with flood gates and small laterals are conveying the water to the land.

The Hamakua ditch, the property of the Hawaii Irrigation Company, at Hamakua, H. I., was formerly opened in July. The system has a capacity of 100,000,000 gallons of water per day.

President Taft has thrown open for entry. 10,576 acres of land near El Reno, Oklahoma, which were formerly in



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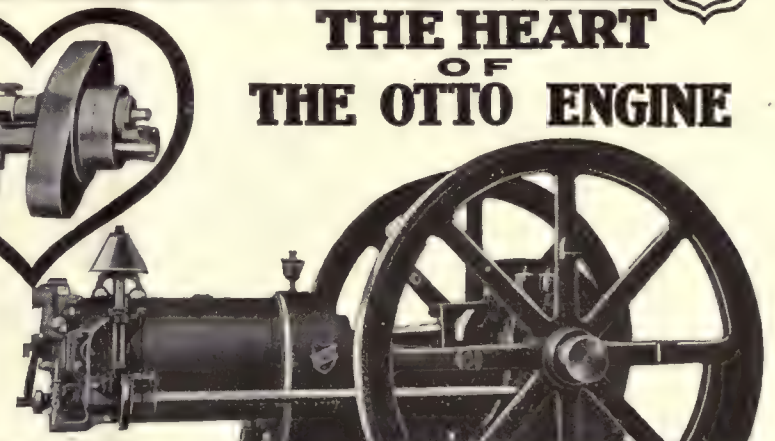


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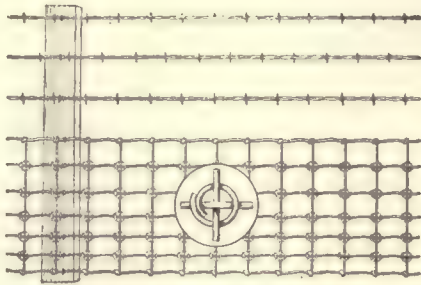
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the Cheyenne and Arapahoe Indian reservations. The lands will be sold at public auction at El Reno on November 15th, in tracts not exceeding 80 acres to persons qualified to make homestead entries. One-fifth of the purchase price and the usual homestead fees and commissions must be paid on the day of the purchase and the remainder in six annual installments.

Large tracts of land in the vicinity of Rochester, Washington, is being purchased by a Seattle company, who are dividing it into small tracts and placing it on the market. There are thousands of acres of level prairie land near Rochester that may be watered by pumping the underflow. The land is adapted to the growing of pears, apples, cherries, plums, and also small fruits.

John Gardner, of De Pere, Wisconsin, has installed an irrigation system on his garden lands in that city. Water is pumped from Fox river by means of a gasoline engine and then distributed through ditches.

The Irrigation plant at Lake Placedo near Port Lavaca, Texas, has been completed and tested and is a complete success. Water is taken from Lake Placedo.

Fisher Bros., owning a large farm on the Green river, near Dickinson, N. D., report that their irrigation plant which they completed three years ago, but was not used until this year, has proved a great success. The plant has a capacity of 4,000 gallons of water per hour.

The Lobo Lake & Irrigation Company of Crockett, Texas, has filed an amendment to its charter increasing the capital stock from \$50,000 to \$85,000.

L. Gaskill, who owns a ranch four miles east of Snyder, Oklahoma, has purchased a Dempster irrigation outfit, with which to irrigate his land. A tank in which to store water will be dug on a small ridge on the farm which has an elevation of about 20 feet above the rest of the land.

THE GLIDE GRADER, LEVELER AND DITCHER

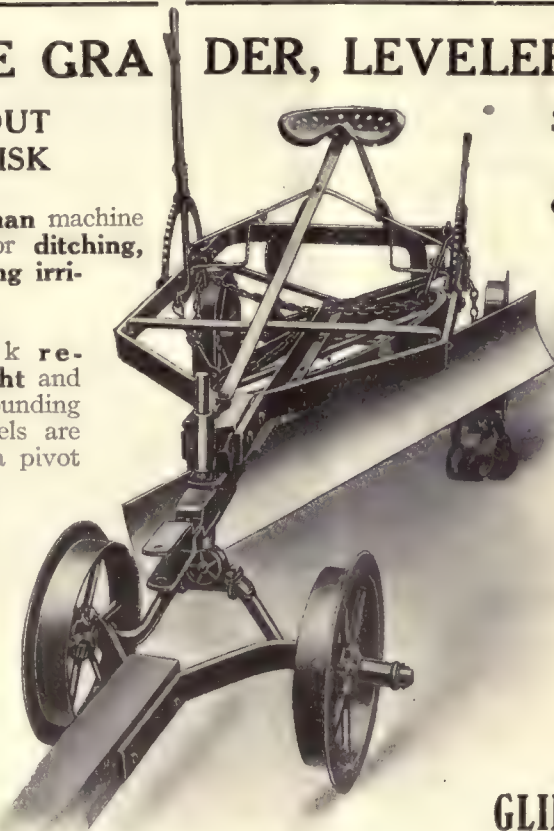
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¶ No slow wheel gears to delay him.

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(Continued from page 604.)

Small Flumes.

Often it is necessary to cross ditches or gulleys with flumes. These may be made either of wood or metal. In wood flumes the frame work should be made first, the trestles on which they are held being made strong enough to hold against all strains, and with a foundation made secure against settling. The settling of a flume in one or two places may cause leakage of the whole amount of water carried. The boards of a flume usually should be laid lengthwise. Several methods of closing the joints are practiced. Sometimes matched lumber is used, but as this is expensive, it is usually more economical to use rough, but straight lumber and caulk the joints with cotton-waste and tar, or with oakum. If the boards fit closely when dry, the swelling of the wood, when water is run in it, should still further close up any cracks. Some of the patent metal flumes are found advantageous as they require less attention to prevent leakage than the wooden ones and also present a better appearance. They cost considerably more in the beginning, but if they are kept painted they will last almost indefinitely.

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Where many laterals are to be run or contour furrows or checks are to be made; it will often be found advisable for the farmer to get a cheap level with which to survey them. Anyone can learn to use these instruments without much difficulty. It will save considerable expense for surveyor's fees. As the instrument is used only at intervals, several farmers can buy one together and get sufficient use of it to pay them well. It is also a very useful instrument for locating main laterals and drain ditches and in leveling land, grading terraces, or for a number of uses that come up on the farm.

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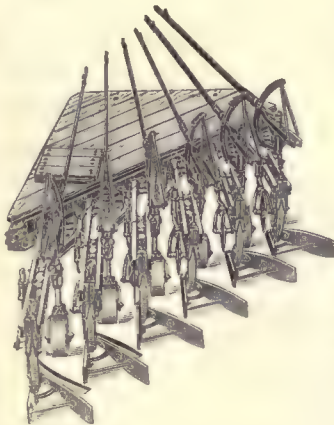
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(Continued from page 608.)

The cotton planting season in the valley begins about the middle of February. It has been found that the best results are accomplished by thoroughly irrigating the soil before planting. The irrigation is done slowly so that the water will reach down to the subsoil. Before this first irrigation the land is plowed deep and thrown into furrows. After the irrigation is finished the ridges are leveled and the planting done where they were formerly located. Constant and frequent cultivation is given the growing plants. It is claimed that it is not necessary to give the growing crop more than two irrigations. An average yield of one bale per acre has been obtained where only one irrigation was given after the cotton was up. Picking begins about June 10 to 15, and by the middle of September most of the picking is done. Much of the cotton land is plowed up by September 1, the fields having been cleared of the staple by that time. Even when no effort is made to increase the yield by a late top crop, the average yield runs from three-fourths to one bale per acre, it is stated.

The early cleaning up of the crop and the burning of the stalks and plowing of the fields in the fall prevent the breeding of the last two generations of the weevil, which takes place in the fall. A new generation of weevil is produced every thirty days, from the middle of May until the time comes for the insects to go into their annual period of hibernation, unless they are destroyed by cultural methods. It is claimed by entomologists that it is the last two broods of the boll weevils in the fall that hibernate and go through the winter. They are more hardy than the generations which precede them each season, and, as they are to a large degree destroyed by the methods which the cotton irrigationists are practicing in this region, the complete eradication of the pest is in a fair way to be finally accomplished in the region where it made its first appearance in the South.

(Continued from page 601.)

Nitric Acid.

This acid consists of nitrogen combined with oxygen, and never occurs in nature in a free state, but is found in many semi-tropical regions in combination with potash, soda and lime, in what are known as "nitrates." They are all, like the salts of ammonia, very soluble in water, those of soda, lime and magnesia attracting moisture from the air, and in a damp atmosphere gradually assume a liquid form. Saltpeter is a compound of nitric acid with



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potash (nitrate of potash), and it may sometimes be used as an influential agent in promoting vegetation. Like the acid itself, these nitrates, when present in large quantities, are destructive of vegetation, and are frequently the cause, in arid and semi-arid regions, of utter barrenness, the nitrous incrustations accumulating upon the surface of the soil. In small quantities, however, they exercise an important and salutary influence on the rapidity of growth.

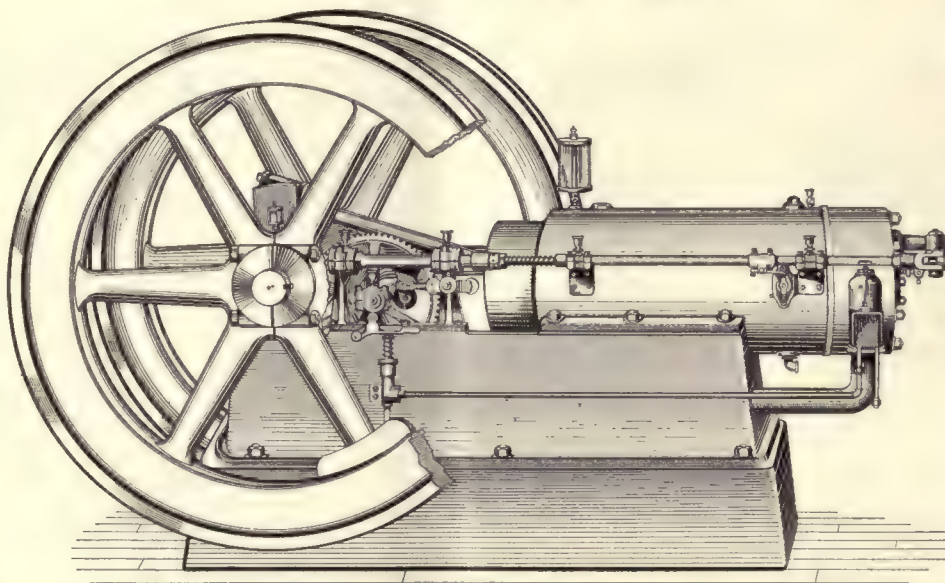
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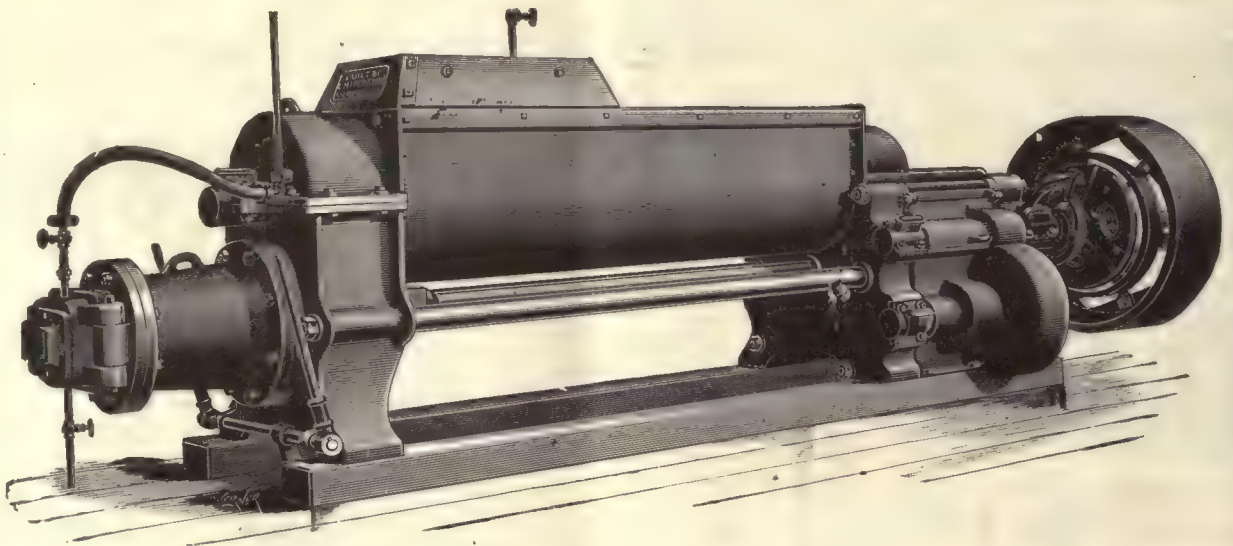
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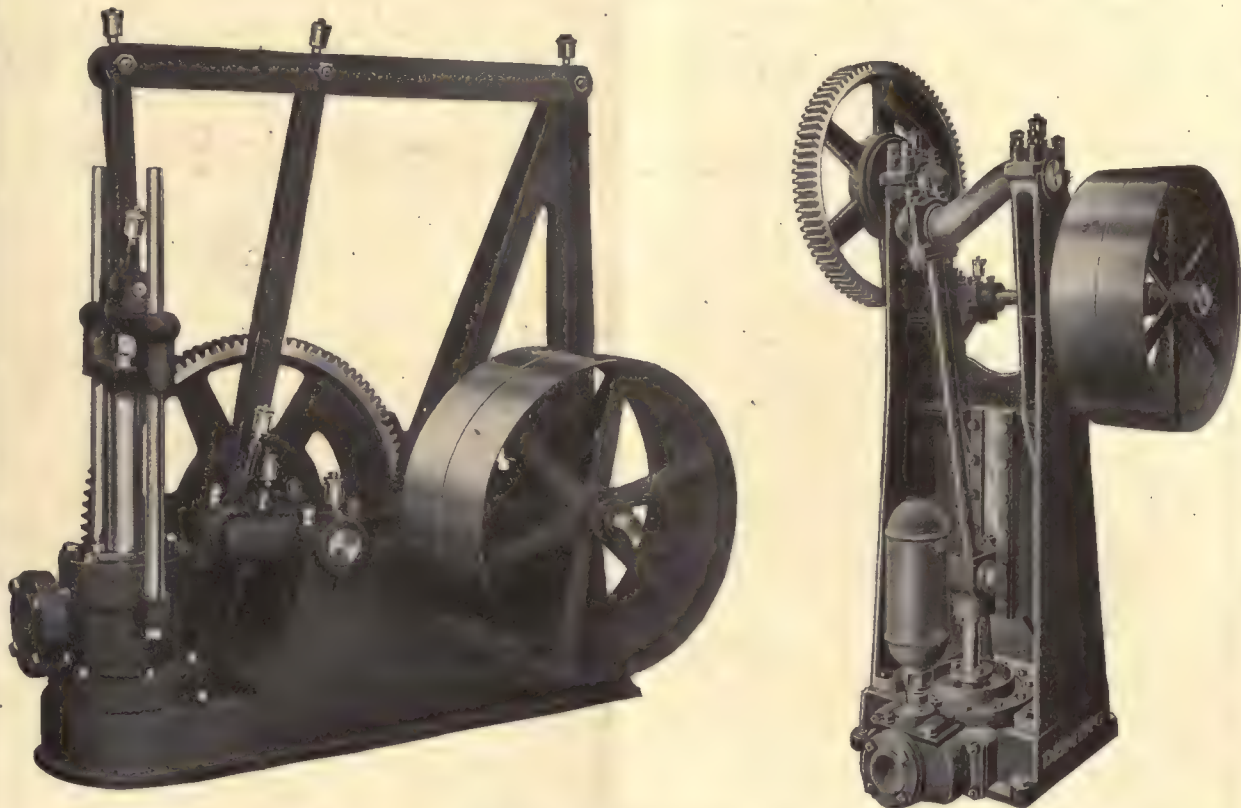
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